SUPPLEMENT—MARCH 1, 1928.

VOL. XXXVIII.

THE

AGRICULTURAL GAZETTE

OF

NEW SOUTH WALES

Issued by Direction of

THE HON. H. V. C. THORBY, M.L.A.

MINISTER OF AGRICULTURE.

W. H. BROWN, *Editor.*

By Authority:

SYDNEY: ALFRED JAMES KENT, GOVERNMENT PRINTER.

1928.

*53997

CONTENTS.

CONTENTS.

CONTENTS.

CONTENTS.

CONTENTS.

CONTENTS.

CONTENTS.

CONTENTS.

CONTENTS.

CONTENTS.

CONTENTS.

CONTENTS.

VOL. XXXVIII. PART 1. JANUARY 1, 1927.

Agricultural Gazette of New South Wales.

Wheat-growing in the South-west and Riverina.

[Continued from Vol. XXXVII, page 877.]

E. S. CLAYTON, H.D.A., Senior Agricultural Instructor.

VARIETIES.

FARMERS are advised not to increase unduly the number of varieties grown, but to limit the number to three, or four at most. Tried and proved varieties should not suddenly be discarded for others until the newer varieties show that they can consistently give better yields. It is a mistake to sow large areas of a new wheat simply because it has given good yields in any particular season or in some other district which may differ considerably in soil and climate.

In the western parts of the south-western district, including Mathoura, Deniliquin, Hillston, Rankin's Springs, and Lake Cargelligo, the best varieties for grain are Federation, Waratah, Union, and Canberra, and for hay Gresley and Waratah.

For the district including Barmedman, West Wyalong, Ungarie, Tallimba, Barellan, and Ariah Park, Federation, Union, Waratah, and Canberra are recommended for grain. Yandilla King may be included for the stronger soils provided it is sown very early; it should not be sown on stubble land in this locality. Gresley and Firbank are recommended for hay.

For Young, Harden, Temora, Henty, Corowa, Wagga, and Junee, Yandilla King, Turvey, Waratah (with Federation for the drier portions), are the best grain varieties, and Barootа Wonder, Turvey, Zealand and Gresley best for hay. Baroota Wonder is particularly popular in the Junee-Ganmain hay-growing district, as it gives a very heavy yield and is ready to cut much earlier than Turvey or Zealand.

For Lockhart, Narrandera, Berrigan, Finley, and Oaklands, Federation, Waratah, Union, and Canberra are recommended for grain, and Gresley and Firbank for hay.

There are a number of new varieties, including Bena, under trial, but sufficient experience has not yet been obtained quite to warrant their inclusion in these recommendations.

The outstanding varieties for the southern district are Federation, Yandilla King, Waratah, and Canberra. Federation is suited to all the drier parts, but does not yield so well as some other varieties where the rainfall is heavier. It is very liable to flag smut and rust, but possesses a short straw and upright head, which enable it to withstand boisterous weather without lodging. Yandilla King, although late maturing, is a very adaptable

variety. It is suited to the eastern portion of the south-western slopes and Riverina, where the rainfall is reliable. This variety does well even in the comparatively dry portions, especially when sown in the heavier soils, but is not suitable for light soils in dry districts. Waratah compares very favourably with Canberra for the driest districts, and appears to be more suitable than this variety in the localities possessing a better rainfall. Although in most districts late-maturing varieties generally give a better yield than those that mature early, it is not always possible or even advisable to sow all late-maturing wheats. In such districts Waratah is a more suitable early-maturing variety than Canberra. Although Waratah can hardly be described as a strong-strawed wheat, it is better in this respect than Canberra.

FERTILISERS.

It would be hard indeed to find a wheat-farmer in the south who does not sow fertiliser with his crops. The question now with the men in this district is not "Will it pay to use fertilisers?" but "How much fertiliser can I profitably apply?" Superphosphate is the only fertiliser used on wheat crops, all tests with others giving inferior results. At present 56 lb. per acre is the usual dressing, but in practically every portion of the south-west it is being found that the quantity can be increased to 84 lb. per acre, and in certain localities to 112 lb. or more.

When land is ploughed early and well worked, large quantities of plant-food are rendered available by the action of sun, air, rain, and bacteria. The frequent working of the fallow greatly assists this action. In our climate, nitrogen is readily made available, and we therefore do not usually find it necessary to apply nitrogenous fertilisers. Phosphoric acid, however, is not present in sufficient quantities, and this deficiency must be made up.

The limiting factors in crop production are the amount of moisture present and the amount of each necessary plant-food. To obtain heavy yields there must be what may be termed a "balanced ration" of plant-food in the soil. If the available supply of any one important plant-food is lacking, the crop yield is limited, no matter how great a quantity of every other plant-food may be available. For example, if on account of faulty cultivation methods only a small amount of nitrogen is rendered available in the soil a very heavy application of superphosphate will not make up for this deficiency; the crop will only be able to take up portion of this heavy dressing, and probably just as good a yield would have been obtained from a smaller amount of superphosphate. If, on the other hand, by judicious working of the fallow a great quantity of nitrogen is rendered available in the soil, a heavy dressing of superphosphate can be profitably applied, so that most of the nitrogen can be taken up by the plants, the result being a greatly increased yield. The position, therefore, is this: If the fallow has been ploughed early and well worked, a heavy dressing of superphosphate and of

seed can be used with profit, but if the fallow has been neglected the dressing of superphosphate should not be unduly heavy as no amount of superphosphate will make up for neglect in the cultivation of the land. This is why good farmers who fallow carefully are able to use heavy dressings of seed and superphosphate with such excellent results.

In every district the most profitable amount varies not only with the soil, but also with the methods of farming adopted, and is a matter for each farmer to test for himself, keeping in mind what has been said. In the more favoured parts of the district, such as Henty, Wagga, Junee, and Coolamon, dressings of 112 lb. per acre are not uncommon, and where good fallowing is practised 84 to 112 lb. can be confidently recommended. In the parts not quite so well favoured in the matter of rainfall, such as Lockhart, Barellan, Ariah Park, and Wyalong, dressings of 84 lb. per acre are common, but only the best worked fallows are given dressings of 1 cwt. per acre. Heavy dressings are to some extent more profitable on the lighter soils (such as pine country) than on the heavier lands, but some of the heavy country, if well worked, responds admirably: this is particularly true of the heavy black clay self-mulching soils. A great deal of experiment work has been conducted with fertilisers, and these tests furnish valuable information as to the various localities and soil types. The most striking increase due to fertilisers was obtained at Moombooldool on light sandy mallee soils. Here a dressing of 132 lb. of superphosphate gave an increase of 3 bushels 20 lb. over the plots receiving 90 lb. superphosphate per acre, and 7 bushels 34 lb. increase over those receiving 56 lb.

The results of the fertiliser trials throughout the Riverina demonstrate what has already been stressed, namely, that to obtain the maximum results from a well-worked fallow it is advisable to put on fairly heavy applications of superphosphate and seed. As far as the dry districts are concerned, superphosphate actually assists the crop to withstand dry weather by causing greater development of the roots. In these localities from 56 to 84 lb. per acre has proved satisfactory. It is possible that this amount may be increased as farming methods improve.

Heavy dressings of superphosphate sometimes induce heavy flag growth and occasionally some crops will in this way appear to be burnt off. This flaggy appearance is frequently very deceptive, however, and such crops, although appearing flaggy near the heads on account of a heavy application of superphosphate, often yield better than adjoining crops which have received less superphosphate and the heads of which are well up above the flag.

The advanced methods adopted in South Australia in the matter of fertilisers are of interest. Heavy dressings are the order of the day, and such an agricultural authority as Professor Perkins considers that to use less than 1 cwt. of superphosphate per acre in South Australia seems equivalent to throwing money away, and that in present circumstances it is probable that the average dressing should be nearer 2 cwt. than 1 cwt. In

New South Wales, however, we have found by careful field experiments that from 56 lb. to 112 lb. of superphosphate is apparently the most profitable amount to apply to most of our wheat soils. The amount can be increased with profit to 1½ cwt. on certain soils only.

In South Australia great attention is paid to the residual effect of heavy dressings of fertiliser and many Riverina farmers also are noticing a wonderful increase in the feeding value of their stubbles, due to the growth of clovers brought about by the liberal use of superphosphate on the wheat crop. Many South Australians have reached the stage when they consider that even if the crop increase does no more than recoup the farmer for the outlay involved in the use of an additional hundredweight of superphosphate, the enhanced value of the grazing is sufficient to justify dressings of 2 cwt. The heavier carrying capacity means more abundant animal droppings and corresponding improvement of soil fertility and ability to produce high crop yields. As the ploughing in of wheat stubble is useless as far as maintaining humus content is concerned, and the growing of leguminous crops for feeding or ploughing in is expensive and somewhat unpopular, heavy dressings of superphosphate should be considered as a means of increasing the humus content of our wheat soils. We have found that heavy applications of superphosphate, especially if continuous, result in a growth of trefoil and clover in the stubbles. If portion of this leguminous growth is fed off by sheep, and the droppings, together with the trefoil residues, ploughed in, an increase in the humus content of the soils will result. If the paddock could be left out for grazing for twelve months it would, of course, be advantageous, but, if not, the stubble should be grazed as early as possible, then burnt and the land scarified. The advisability of applying a ½ cwt. of superphosphate at this period could be considered. If the original dressing had been heavy a good growth of legumes would, in any case, occur, especially on heavy country. This could be grazed until the middle of winter and the residues then ploughed in. In view of the fact that only leguminous plants can be depended upon to effect any great improvement in the humus content of our wheat soils, it is thought that greater use should be made of the vigorous growth of trefoils and clovers which occur naturally on many of our wheat soils, and the trouble even gone to of stimulating clover growth on the lighter soils, where it usually is not so vigorous, by heavy dressings of superphosphate.

Summer Drilling of Superphosphate.

In South Australia the summer drilling of superphosphate is adopted to some extent. While it is realised that the sowing of superphosphate with the seed at seeding time is the cheapest and best method on relatively small areas, the drilling in of the fertiliser in February and March is of wonderful assistance in enabling the wheat grower on large areas to make the most of the usually very limited seeding period. If the superphosphate is drilled in in late summer the grower can then afford to wait for good seeding weather so that the whole area will be sown under ideal seeding conditions.

When the rain ultimately falls and the land is ready for seeding, the seed is broadcasted and harrowed in. In this way it is possible to sow a great area within a few days. Broadcasting is not as a rule practised in New South Wales. During the 1925 seeding season, however, dry weather so delayed seeding operations that when the rainfall came a few men on heavy country resorted to broadcasting in order to get their prepared fallows sown. The results were very satisfactory.

The summer drilling of superphosphate and subsequent broadcasting of the seed cannot be generally recommended in New South Wales on the experience so far obtained, but it is thought that this practice could be adopted with profit on the heavy, sticky clay soils found scattered throughout our wheat districts, particularly on the Bland, which remain so saturated and are so difficult to sow in a wet season. Where a large area of land is to be sown, this method should also prove useful. No fears need be entertained of the fertiliser being partly leached out of the soil. The superphosphate will slowly revert in the moist soil, and even heavy rain will not wash it out. It will remain in the soil to be used by the plant, and in this respect will be quite as satisfactory as if drilled in at the same time as the seed. In view of the difficulty experienced by many growers in getting their crops sown in such a wet season as the present (1926), it is thought that wheat farmers on heavy, puggy soils, or soils that are in low situations, should adopt this system of drilling in the superphosphate in early autumn and broadcasting the seed in the winter.

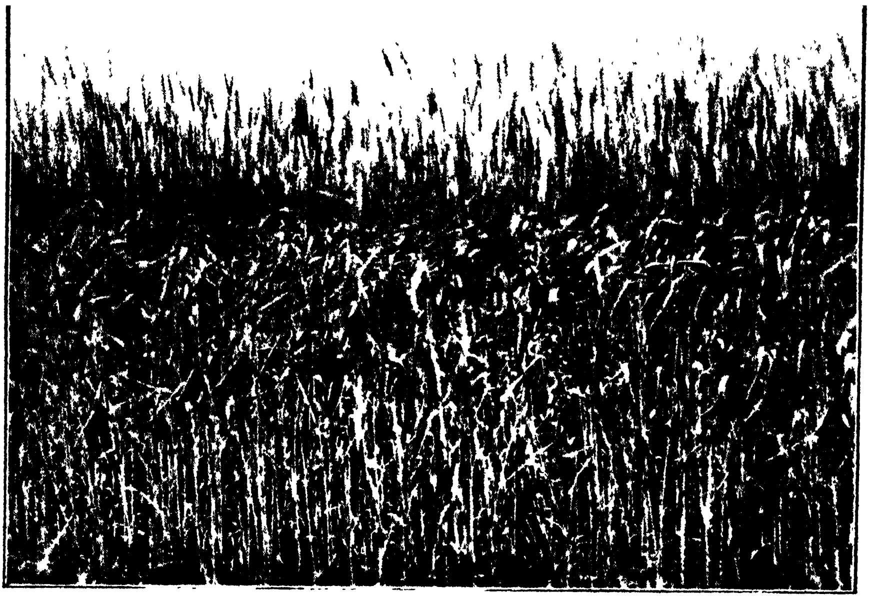
Gypsum.

Gypsum has been used with striking success for the improvement of the physical condition of the heavy red clay soils of the Murrumbidgee Irrigation Area. It has also been used to some slight extent on wheat soils, particularly in Victoria. When 20 to 30 cwt. per acre is applied to very heavy clay soils it is found that the physical condition is greatly improved, and that such soils do not then so readily form a hard surface crust after rain. The result of this improved physical condition is that the soil is much easier to cultivate, and the germination and growth of the wheat crops are more satisfactory. The drainage also is improved. A field experiment at Goroke (Victoria) on heavy red land showed that one application of gypsum at 30 cwt. to the acre increased the wheat yield an average of 7¾ bushels per acre for four years. At the present time it is thought that probably the results of applying gypsum to our moderately heavy soils would not be sufficiently marked to justify the expense. Gypsum, however, is likely to be of great advantage on the heavy, puggy, red clay soils to be found scattered throughout the southern districts. These soils are particularly heavy, and stubborn to cultivate, and an application of gypsum at the rate of 30 cwt. per acre is well worth a trial.

The physical condition of these particular soils renders them so exceptionally difficult to work that they cannot be brought into a suitable condition for the growing of wheat (except in particularly favourable seasons)

unless some action is taken to improve their physical condition. For this purpose gypsum is undoubtedly of wonderful assistance, owing principally to its action in flocculating the particles of clay. After an application of gypsum these refractory soils can be ploughed and cultivated with no more difficulty than is experienced when handling the average medium strong loams.

The Victorian deposits of gypsum are of rather good quality, averaging between 85 and 90 per cent. of sulphate of lime. The price in Victoria is 10s. a ton on trucks in bulk at the siding (bags extra). To this cost the rail freight must be added. Gypsum is railed at fertiliser rates, and can thus be landed at most sidings in Victoria for about £1 a ton (including original cost and rail freight).



A Crop of Turvey that yielded 37 bushels.
With this crop Mr. D. Bolte won the West Wyalong Crop Competition in the present season.

On the Murrumbidgee Irrigation Area Victorian gypsum costs the farmer £2 5s. to £2 10s. a ton in bags at rail Leeton. Although this high cost does not prevent its use on the irrigation farms, it is too great to render the application of gypsum profitable to heavy wheat soils, with the possible exception of the extra heavy pug soils previously referred to.

The gypsum deposit along the Hillston line is rather thin, and the average quality is low compared with that of the Victorian product. A rich deposit exists, however, farther north in New South Wales, near the line from Condobolin to Broken Hill. When this gypsum is available to New South Wales farmers it is anticipated that the low rail haulage will enable

the product to be purchased at a reasonable price. When this is the case the use of gypsum may be extended even to the medium-heavy red clay soils of the wheat belt.

SOWING PROBLEMS.

Time of Sowing.

April is the best month for sowing in the drier parts of the Riverina and south-western district. A study of the rainfall tables reveals that this is one of the driest months of the year, consequently sowing has frequently to be delayed. It is always an anxious time for the wheat-grower, and it frequently happens that when the sowing is delayed by dry weather in April, when rain finally does come in May or June it is so continuous and there is so little evaporation that the wheat can only be sown while the land is too wet—what is popuarly known as "mucked-in." Sowing in a dry seed-bed has many disadvantages, but it must be resorted to when the season is dry and a large area has to be sown. In 1924 the wheat sown after the heavy rains produced the best crops on account of the long, moist growing season. In 1925 the best crops were sown prior to the rains. Crops sown after the rain were too late, and suffered on account of the dry spring and summer.

The main objections to dry sowing are the increased liability of the crop to flag smut infection and the vigorous growth of weeds. However, if the directions to be given in a later article for the control of flag smut are carried out, this disease will not cause such great losses, and if the fallows have been well worked, weeds will not be quite so troublesome, so that dry sowing can be carried out when this action is necessary.

The following sowing periods are recommended:—

Western Portion (including Lake Cargelligo, Rankin's Springs, Hillston, Merriwagga, and Deniliquin).—Early sowing, early April; midseason sowing, to the second week in May; late sowing, not advisable.

Central Portion (Wyalong, Barellan, Narrandera, Berrigan, and Lockhart).—Early sowing, middle of April; midseason sowing, early May; late sowing, to the end of May.

Eastern Portion (including Young, Harden, Cootamundra, Junee, Coolamon, Wagga, Henty, Culcairn, and Corowa).—Early sowing, end of April; midseason sowing, May; late sowing, to the middle of June.

Preparation for Sowing.

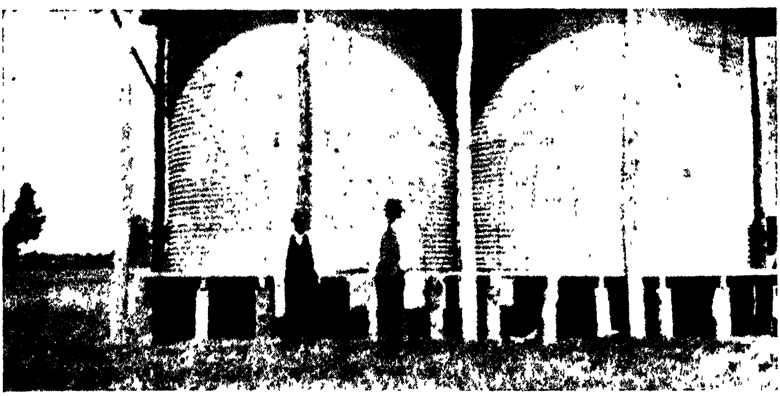
Great care should be exercised at sowing time. The seed should be sown only when the land is in good condition. If sown when too moist, the resultant crop will be very disappointing. If heavy or continuous rains beat down the surface and cause weeds to grow rapidly, the fallow must be well cultivated (but as shallow as possible) before sowing. If necessary, cultivate twice before sowing. A good practice is to cultivate with wide points on the implement and with a set of harrows dragging behind. The

A Common Source of Admixture.

Admixtures often occur by feeding horses on chaff containing mature wheat. Most wheaten hay fed to horses is not cut until the grain is fairly well developed—in fact, the grain in many farmers' samples of chaff is sufficiently mature to germinate. The feeding of such chaff results in the growth of numerous "strangers" throughout the crop. Around Wagga, for example, where Baroota Wonder, Turvey, and Wardon are largely grown for hay, heads of these wheats may be seen scattered throughout many of the grain crops. Any farmer specialising in the growing of pure seed for sale should avoid risk by feeding his horses on oaten chaff. In the event of any oats germinating and growing in the wheat crop the grader can be depended upon to remove them before the sample is sold for seed.

Rate of Sowing.

There has been a tendency of late years to increase the rate of seeding. A few years ago 40 lb. of seed per acre was considered sufficient, but now in the older and safer districts quite a number of farmers are sowing as



Silos are becoming a Feature of well-equipped Wheat Farms.

This pair of silos is on a farm near Barellan. When the wheat season is over they are used for storing oats for sheep feed

much as 80 lb. of graded seed per acre. The high rate of seeding is adopted because on well prepared fallow it gives a heavier yield; the crops are usually also shorter than those sown thinly.

In those districts where the rainfall is reliable, such as in the wide range of country between Henty, Wagga, Junee, Temora, and Young, a seeding of from 60 to 80 lb. of graded wheat can be recommended. In the less favoured parts of the Riverina and south-western slopes 50 to 60 lb. of seed has proved to be a very satisfactory seeding.

It is advisable to bear in mind that to get the maximum results from a well prepared early fallow where a good supply of moisture is stored, a heavy seeding is required. The class of country must also be considered. A better

and more even germination is usually obtained on the lighter soils than on heavy land; consequently the latter should receive a little more seed. Heavy country is also generally better suited to carrying a heavy crop. At Mathoura, on heavy plain county, in 1924, a field experiment showed 80 lb. of seed per acre to be most suitable; this plot gave an increase of 3 bushels 18 lb. per acre over the plot receiving 58 lb. per acre. The time of the year must be considered. Early-sown crops which have more time to stool need not be sown so heavily as those sown later. The variety is also important—poor stooling varieties, such as most of our quick-growing wheats, must be sown thicker. Varieties with a large grain, such as Yandilla King, should be sown more thickly than other late maturing varieties with a smaller grain. The correct amount of seed for any locality cannot be definitely stated, as the condition of the fallows and other factors must be considered. It is a matter in which each man must use his own judgment at the time of seeding.

Briefly, the rate of seeding depends on the variety, date of sowing, district, and condition of the fallow. The heaviest applications of seed are made in those localities with a reasonably heavy and reliable rainfall, such as Henty, Wagga, Junee, Young, and intermediate districts. At Wagga a few farmers sow 80 to 90 lb. of graded seed per acre. Heavy seeding is also rather effective in checking the growth of weeds and wild oats on dirty country.

Slow Running of the Seed Drill.

The use of dry copper carbonate for the prevention of bunt causes the seed to run more slowly, particularly in wet weather. It is often found necessary to set the drill to sow faster than actually desired. If it is intended to sow 60 lb. of seed, the drill should be set to sow 65 to 70 lb. per acre. Many of the thin crops seen in 1925 were due to the slow running of seed treated with copper carbonate. This powder tends to accumulate on the sowing cups of the seed drill and places considerable strain on the mechanism, and in damp weather even causes breakages. It has been found advisable, therefore, to grease the front of the revolving cups with a mixture of kerosene and oil each morning to ensure free running.

(*To be concluded.*)

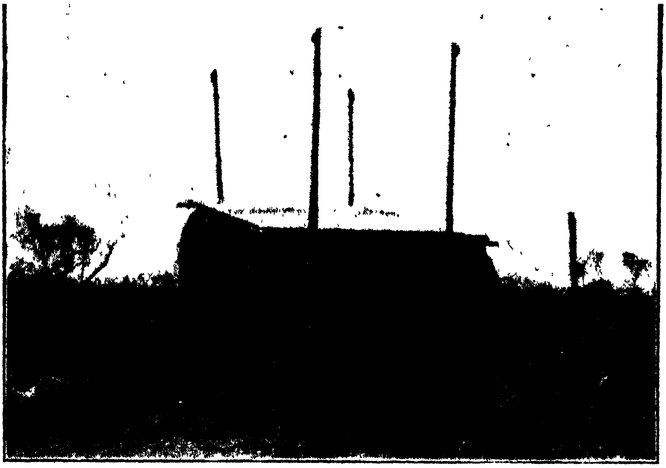
THE VALUE OF AN ISOLATION PADDOCK.

EVERY dairy-farmer should have a small paddock where he can keep a beast absolutely away from all other cattle. Then, every time he buys new cattle he can keep them under observation until he is certain they are free from disease. It is quite a simple thing, yet probably not 1 per cent. of the dairy farmers on the coast have a paddock in which they can isolate cattle suspected of suffering from disease. The reason why abortion disease is so common is that one of the commonest ways of spreading it is the sale of infected cattle.

How Clarence River Farmers Cover Lucerne Haystacks.

The accompanying illustration shows a convenient and effective method employed by farmers on the Clarence River for covering their lucerne haystacks.

Four poles are erected, with pulleys attached to the top, and a windlass near the ground at a convenient height for working. A roof is then built on a framework between the four poles, and by means of wires running over



Lucerne Haystack with Moveable Cover.

the pulleys to the windlasses the roof is elevated as desired for stack-building, and lowered again when operations cease, and left at a sufficient angle to run off water. Wires are also attached to the corners of the roof, by which it is fastened down when in position on the stack.

The method is very convenient and effective in covering the stacks, as each cut of hay can be added with little trouble, and it has the additional recommendation of being cheap.—M. J. E. Squire, Agricultural Instructor.

Fallow as a Method of Conserving Moisture.

The preparation of a good fallow demands a knowledge of the principles underlying the storage of moisture in the soil and its retention by a soil mulch; also the peculiarities of the wheat plant itself have to be taken into account. If trapping rain is the prime object of the fallow, then obviously the earlier in the year the fallow is made the more effective it is, because rain soaks into ploughed land better than it does into hard soil. It is just as important to prevent the "run off" the surface in the wheat belt as it is to encourage it in the moister parts of the State. In the dry north (of Victoria) it is the aim of every good farmer to catch and store every drop of water that falls on this fallow.—H. A. Mullett, Superintendent of Agriculture, Victoria.

Winter Green Fodder Crop Competitions.

Lower North Coast, 1926.

J. M. PITT, H.D.A., Senior Agricultural Instructor.*

THE season 1926 was marked by considerable advancement in winter green fodder contests. Since 1922 local competitions have been conducted with a fair amount of enthusiasm and support, first by the Hannam Vale branch, and latterly by the Dumaresq Island branch of the Agricultural Bureau. It was not until this year that a competitive appeal was made to the farmers connected with the Lower North Coast branches of the Agricultural Bureau in connection with winter fodder growing on an organised basis. Briefly, the movement aims at organised and systematic green fodder production in the interests of greater security in the diarying industry, in preference to fodder conservation, an undertaking that has, so far, not appealed to the Lower North Coast dairyman, chiefly because he is able to have a succession of green fodder available throughout the greater part of every year, and with very little exertion. At any rate, it may reasonably be stated that those who will not maintain a succession of green fodder crops when they have almost unlimited opportunities at hand for doing so will certainly not go to the greater trouble and expense of conservation.

The opportunity afforded the farmer of figuring successfully in the local competition, carrying with it the right to automatically compete against fellow members of similar organisations in other districts for the "Champion Green Fodder Plot," makes the movement sufficiently attractive to appeal to the sporting instincts of the farmer, and arouses keenness and rivalry, which are usually absent where the contests are confined to small localities only. Furthermore, he is able to study approved methods in winter fodder growing and gather ideas that probably would have passed unnoticed were not the movement of some special significance. The reasonings of the judge during the allocation of points according to the scale, and the various other reports, &c., issued by the judges from other plots and from time to time, all help to arouse curiosity and a desire to do better next time. It is hoped, as the movement grows, to secure recognition from the Royal Agricultural Society. At the present time the championship carries with it a handsome trophy, subscribed to equally by the Bureau branches competing.

Conditions Governing the Contests.

Each bureau conducts its own contest, the winning entries automatically competing for the district championship. The object of the contest is to stimulate winter fodder production.

* Mr. Pitt acted as judge in the competitions referred to.—ED.

No hard-and-fast conditions are imposed on the competitors. The greater the freedom the farmer gets in these matters, the greater will his interest be. To be a competitor, it is necessary for him to have at least 2 acres growing during the winter, half an acre of which must be reserved for judging in the local competition, to take place during the last week in August, and for the championship during the first week in September. The farmer may make several entries if he so wishes. It is not necessary to have all sowings made at the one time. Discretion is necessary in choosing the right varieties or mixtures, the quantities of each to be sown, and the time of sowing, so that a regular and constant supply of green fodder will be maintained throughout the times of greatest scarcity, the aim being to have a maximum growth on the plot reserved for competition at the time of judging stated. Seed in any quantity may be used at the discretion of the grower, and similar conditions apply to the use of fertiliser. All cultural operations are according to the farmer's ideas, and the crop remains his. It was deemed advisable to close entries at 30th June, chiefly to exclude the farmer who discovers, about judging time, and after a tour of inspection of other plots in his district, that his crop should win. On the other hand, there is nothing in the conditions to prevent a farmer withdrawing his plot at any time after the entry is made, should it be required for fodder.

Judging is done in accordance with a scale of points which takes into account the suitability of crop for fodder (more points being allowed for balanced mixtures than for one-class crops—see below); stooling and thickness of stand; period of maturity or best fodder stage (a crop just breaking into head being preferable to one too far in head or too immature); leafiness, greenness, freedom from weeds and disease, and general appearance. More points are deducted for unevenness in the crop due to poor farming methods—unsightly "back ups" and clean outs, &c.—than for where the crop has lodged owing to violent weather conditions.

The following is a section of the scale of points used, showing comparative values under "Suitability of Crop for Fodder" heading:—

SCALE OF POINTS.

Oats alone, 20 points; wheat alone, 16 points; barley alone, 18 points; peas alone, 16 points; oats and vetches, 27 points; wheat and peas, 23 points; barley and vetches, 25 points; oats and peas, 23 points; wheat and field peas, 19 points; barley and peas, 21 points; vetches alone, 20 points; oats and peas and vetches, 20 points; wheat and peas and vetches, 26 points; barley, peas and vetches, 28 points.

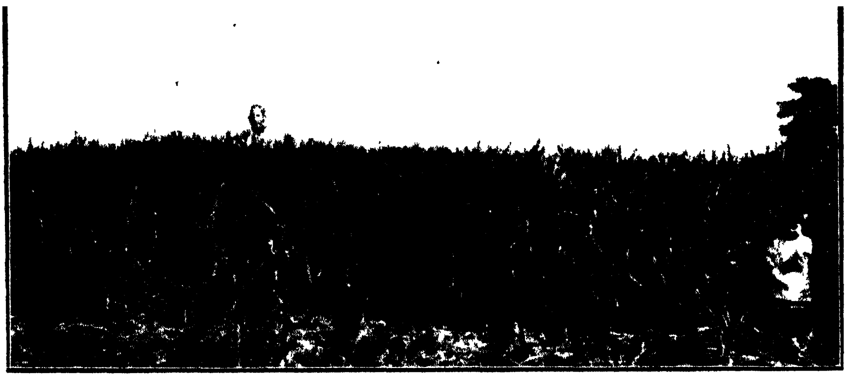
Thus those who grow oats alone can only receive a maximum of 20 points, but where vetches are included, and the crop carries a desirable proportion of this legume, the maximum is 27 points, and so on. It will be noted in the table of yields which follows later that, although vetches were included in some plots, the points allotted were similar to those allowed for the cereal crop alone. This was because of the almost total failure of the legume.

Seasonal Conditions.

Manning River District.—A very dry, late summer, followed by heavy rainfalls during the autumn, hindered cultural operations. Sowings, consequently, were made on poorly-prepared plots, and were mostly delayed. During June further heavy rain battered the crops, but the only rain of value after this month, and up till the time of judging, was a fairly general fall of about 1½ inches early in July. During the greater part of that month and August the conditions were quite unseasonable—warm days and nights with almost a total absence of frosts. In consequence, many of the early plots were very poor, and rust made its appearance earlier than usual.

Late-sown crops were mostly good, but, of course, were too backward to secure highest points. A few crops lodged during a strong wind storm in August.

The rainfall for Taree, which is representative of the Taree Estate and Dumaresq Island districts, was as follows: March, 717 points; April 418 points; May, 562 points; June, 293 points; July, 636 points; August, 154 points.



Mr. J. P. Mooney's Plot of Sunrise Oats (Dumaresq Island Competition).

Bulby.—This centre is more elevated, and is 30 miles south of Taree. Conditions during the summer and autumn were somewhat similar. The winter months, however, were colder. The oat crops maintained a greener and fresher appearance, and rust did not appear until late.

Bandon Grove (10 miles north of Dungog).—Farmers in this district were better off still. Normal conditions prevailed; land was brought to a good tilth early; the crops were sown to time, and the winter months were more seasonable. Crops were luxuriant, and rust was almost absent.

Dumaresq Island Competition.

This local contest was run in conjunction with a well-known fertiliser firm, which, in addition to supplying nitrate of soda and other fertilisers gratis, donated handsome trophies for competition.

The contest was run as follows:—Sunrise oats were used throughout all the plots. One half-acre was fertilised with bonedust ¼ cwt., and superphosphate ¾ cwt., per acre, and another half-acre adjoining was fertilised with a similar mixture plus nitrate of soda at the rate of 1 cwt. per acre when the crop was 6 inches high. The entrants in the contest were eligible for the competition open to Bureau branches on the Lower North Coast. There were eleven entries.

It is not intended to deal with all the plots in detail here, further than to state that the majority suffered from want of better preparatory cultivation. One ploughing, and that just prior to sowing, does not give the soil a chance to "mellow," with the result that if the season be at all unfavourable, the crop suffers considerably.

The winning plot—Mr. J. P. Mooney's—was one exception. The soil here, a deep loam, is better drained than most soils on the island, and is more easy of access after heavy rain. The previous crop had been potatoes, which had been fertilised. Prior to sowing two ploughings were given, and the soil was brought to a fine tilth by other operations. The crop was a dense growth of Sunrise oats, leafy and succulent. Its weight exceeded that of any other plot. Although slightly rusty, and showing a little discoloured leaf, the crop was a very fine one.

Some of the later sown plots, notably Messrs. D. Dorward's and W. J. Adams's, promised well, but were too late for the judging, which took place late in August. These were also sown on fairly well-prepared plots.

Sunrise oats was the crop sown on all plots, fertilisers being used at the rates mentioned above. The results of the competition were as follows:—

RESULTS of the Dumaresq Island Competition.

Competitor	Suitability of Crop for Fodder.	Stooling and Thickness of Stand	Period of Maturity, Best Fodder Stage.	General appearance.	Leafiness and Greenness of Plot.	Freedom from Rust, Disease, and Weeds.	Yield (2 points per ton allowed).	Total.
Max. Points	30	15	15	15	15	10	.	...
	Points.	Points.	Points.	Points.	Points.	Points.	Points.	Points.
J. P. Mooney*	20	12	12	10	13	6	37	110
D. Dorward ...	20	13	8	12	13	8	34	108
R. Brimstone...	20	10	11	11	8	5	27	92
H. Nellaby ...	20	8	10	10	7	6	17	78
F. Collins ...	20	9	14	10	10	7	25	95
W. Payne ...	20	11	8	10	11	7	32	99

Taree Estate Competition.

In the contest run by the Taree Estate Bureau there were nine entries, including a wide range of crops—field peas, oats and vetches, barley, and oats alone. Cultural operations were, in most instances, late, as also were the sowings. One ploughing only is more the rule than the exception in preparing for winter fodder in these parts, and the crops suffer in consequence.

Two crops were inseparable for leading position. Mr. G. Levick's crop of Mulga oats and vetches (the latter failing) was sown on a rich portion of land previously under potatoes. Two ploughings were given. The crop was rather immature, but was dense, clean, and luxuriant. Mr. J. Murdock's crop of Sunrise oats, sown after maize on land once ploughed, was even a shade past its best, and it was rusty.

Field peas alone, entered by Mr. L. Northcott, although a nice plot, were rather too unbalanced for an ideal fodder. Cows, in many instances, do not take readily to them, especially when immature.

RESULTS of the Taree Estate Competition.

Competitor.	Crop	Suitability of Crop for Fodder.	Stooling and Thickness of Stand.	Period of Maturity—Best Fodder Stage.	General Appearance	Leafiness and Greenness of Plot.	Freedom from Rust, Disease, and Weeds.	Yield—2 points per ton allowed.	Total.
	Maximum Points...	30	15	15	15	15	10		
		Points	Points	Points	Points	Points	Points.	Points.	Points.
*G. Levick ...	Mulga oats and vetches...	20	13	8	8	12	9	29	99
*J. Murdoch ...	Sunrise oats	20	11	14	12	8	6	28	99
L. Northcott ...	Grey field peas	16	12	9	9	12	9	28	95
F. Flett	Sunrise oats and vetches	23	9	11	7	8	5	17	80
F. Redman ...	Cape barley	18	8	12	10	7	6	11	72

Bandon Grove Competition.

Although coming into the contest late with three entries, the Bandon Grove Bureau plots were, on the whole, the best prepared. Those entered by Mr. Walter Smith and Mr. Alex. Smith were taken in hand several months before sowing. Three ploughings are not uncommon, with several other discings, &c., in between to get a good seed-bed. The result was very noticeable, as the crops were luxuriant and almost entirely free from rust. Mr. Walter Smith's plot of Sunrise oats was 6 feet high, luxuriant and all standing. The thin stand, however, had caused the growth to be coarse, and it was not so leafy as Mr. Alex. Smith's plot. The latter was a luxuriant plot of Mulga oats and wheat mixed, at almost the best fodder stage, very leafy and dense. A little lodging had taken place, otherwise the crop was a very fine one and weighed heavily. Mr. Foster's plot was rusty and weighed light.

RESULTS of the Bandon Grove Competition.

Competitor.	Crop	Suitability of Crop for Fodder.	Stooling and Thickness of Stand.	Period of Maturity—Best Fodder Stage.	General Appearance.	Leafiness and Greenness of Plot.	Freedom from Rust, Disease, and Weeds.	Yield—2 points per ton allowed.	Total.
	Maximum Points... ...	36	15	15	15	15	10	...	...
		Points	Points	Points	Points	Points	Points	Points	Points.
Alex. Smith ...	Mulga oats and Gresley wheat.	20	13	14	9	14	8	34	112
Walter Smith ..	Sunrise oats	20	10	13	12	13	9	29	106
Alex. Foster ...	Algerian oats	20	13	13	11	10	5	24	96

Bulby Bureau Competition.

There were quite a number of entries in the local contest, but only two completed the test, the remainder withdrawing owing to the backwardness of the crops, due to late sowing and dry conditions. This district is somewhat elevated, the hills being of rich volcanic soil and the flats of a dark chocolate loam. Frosts were prevalent, and this had the effect of keeping rust off. Mr. J. J. Milligan's crop of Mulga oats and vetches (the latter

Mr. Walter Smith's Sunrise Oats (Bandon Grove Competition).

Mr. Alex. Smith's Mulga Oats and Gresley Wheat mixed (Bandon Grove Competition).

failing) was clean, even, green, and succulent. It was on the thin side, however, and weighed somewhat light. Mr. Thompson's plot of Mulga oats and vetches was also a fine, clean, upstanding crop, but was also on the thin side. His crop of Clarendon wheat was one of the finest seen for some time, but was deficient in leaf and also weighed light. Both plots were well prepared.

RESULTS of the Bulby Bureau Competition.

Competitor.	Crop.	Suitability of Crop for Fodder.	Stooling and Thickness of Stand.	Period of Maturity—Best Fodder Stage.	General Appearance.	Leafiness and Greenness.	Freedom from Rust, Disease, and Weeds.	Yield—2 points per ton allowed.	Total.
	Maximum Points... ...	30	15	15	15	15	10	...	...
		Points.	Points.	Points.	Points.	Points.	Points.	Points.	Points.
J. J. Milligan ...	Mulga oats and vetches ...	20	11	14	14	14	9	25	107
T. Paterson ...	Mulga oats and vetches ...	21	10	13	14	13	8	25	104
T. Paterson ...	Clarendon wheat	16	8	12	14	12	9	18	89

The District Championship.

Mr. H. C. Stening, Chief Instructor, made the following placings for the District Championship, for which the winners of the foregoing competitions were eligible:—

CHAMPIONSHIP AWARDS.

Competitor.	Crop.	Date Sown.	Suitability of Crop for Fodder	Stooling and Thickness	Period of Maturity—Best Fodder Stage.	General Appearance.	Leafiness and Greenness.	Freedom from Rust, Disease, and Weeds	Yield—2 points per ton allowed.	Total.
	Maximum Points .	....	30	15	15	15	15	10	.	...
			Points.	Points.	Points.	Points.	Points.	Points	Points	Points
J. P. Mooney, Dumaresq Island	Sunrise oats .	28 April	20	12	13	12	12	7	39	115
Alex Smith, Bandon Grove.	Sunrise oats and Gresley wheat.	15 April	20	13	14	9	14	9	34	113
J. J Milligan, Bulby.	Mulga oats ..	. . . . .	20	11	14	14	14	9	25	107
G. G. Levick, Taree Estate.	Mulga oats .	14 May ..	20	13	9	8	14	8	29	101

Mr. J. P Mooney's plot thus secured the championship honours for the season.

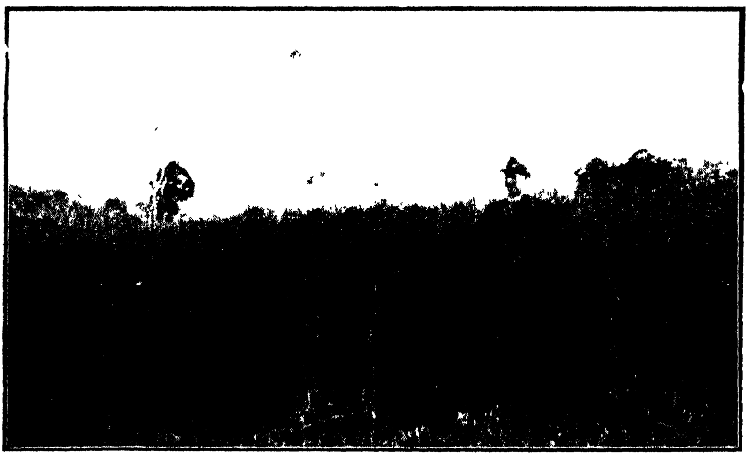
Remarks.

Cultivation.—Too much emphasis cannot be placed upon the importance of having a well-prepared seed plot. Rushing winter fodders in after a rough ploughing immediately after the preceding crop was too much in evidence this year, resulting in inferior crops. While it is not always possible on the rich alluvial coastal farms of limited areas to have much land remaining idle for any length of time, still the advantages of a short, well-worked fallow have been most noticeable in the contest under review. Bringing the land under the plough at least three months before sowing, with additional working, such as ploughing and disc-harrowing and cultivating at intervals,

are operations that bring the seed-bed into a moist, mellow, and clean condition, and assure even growth throughout. To follow a system of rotation of cropping also helps to maintain the fertility of the soil, and in one or tw instances this season where winter fodders have followed potatoes—an ideal rotation in which the cultural operations applied to the potato are o great value to the fodders—the results have been most marked.

Crops.—A reference to the scale of points on page 14 gives a fair idea of the class of fodders mostly grown, and the order of value. The table has been prepared in the main from a consensus of opinions of progressive dairymen, and the points arranged accordingly.

All agreed that a mixture of cereal and legume is the most desirable class of fodder, and although both field peas and vetches are at present tried by a very limited number of growers, they are certainly giving good results. Another mixture—wheat, oats, and legume—tried by Mr. Alex. Smith, of Bandon Grove, for the past three seasons, is also giving excellent results. Equal quantities of Sunrise oats and Gresley wheat, plus the legume, and Mulga oats, Gresley wheat, and legume are compared with the oats and



Mr. T. Paterson's Mulga Oats (on left) and Clarendon Wheat (on right) (Bulby Competition).

wheat sown separately. The value of these mixtures is that the wheat, being tougher in the stalk, holds the oats up remarkably well. In each case the oat plots sown adjoining the mixed plots lodged badly. The yield of the mixed crop, too, was heavier, the reason being that soil ingredients are used in different quantities and in a different manner by each cereal. Thus a greater area of the plot is brought into use than is the case when each cereal is sown separately. The idea is sure to become popular.

Time of Sowing.—There is a great diversity of opinion among farmers as to the time to sow various crops. While one of the objects of the contests is to have half an acre at its best stage for the judge at the end of August,

the main idea is, of course, to encourage the more extensive growing of winter fodders. For a succession throughout the winter and spring, sowings may be made from mid-February until almost the end of June. To have a crop, say, of Sunrise oats somewhere near the desirable stage of maturity at the end of August, normally a sowing may be made during the first week in April. It must be understood, however, that abnormal seasonal conditions, situation of crop (on alluvial or poor soil), previous cultivation of plot, and the district play a very important part in influencing the maturity, and variations ranging to two and a half weeks from normal have been noticed this year. To overcome this farmers are recommended to make, where possible, three sowings, ranging between mid-March and mid-April.

Mr. J. J. Milligan's Mulga Oats (Bulby Competition).

Quantity to Sow.—Almost as great a difference of opinion exists in regard to the quantity of seed to sow per acre. The Department's recommendation for the Lower North Coast is 2 bushels of wheat or oats per acre where these crops are sown separately, and ½ bushel less cereal where the legume is included. This will be found fairly accurate over a range of soils.

Experience on the rich alluvial, well-prepared soils is that these quantities are slightly high, the thick sowing tending to make the crop lodge in rough weather. Sowing too lightly, on the other hand, while probably resulting in the crop standing, encourages a coarser growth of stalk, less foliage, and lighter yield. On the poorer or second-class soils, 2 bushels of the cereals sown alone is advisable, the growth being seldom as heavy and the stooling not so profuse as on the richer soils.

The addition of fertilisers is strongly recommended to growers who are not already adopting this method of giving the crop a good start.

DIPPING OF LAMBS.

OWING to the very wet weather during last winter, ticks and lice have been very prevalent, and this has necessitated the quarantining of a number of holdings until the sheep have been dipped. As no records were available as to the effect of dipping of lambs intended for market, in respect of either growth or appearance of the wool, it was decided to carry out an experiment at Bathurst Experiment Farm this season, and on 10th September eighteen average lambs were divided into three lots and weighed, after which one lot was dipped in an arsenical powder dip, a second in a carbolic fluid dip, and the third was kept as a check. No ticks or lice were present.

The lambs were again weighed on 21st October, and the wool examined. It was found that the lambs were all in excellent condition without noticeable difference between the several lots. Very little difference was to be seen in the wool, except that in the case of the lot dipped with the carbolic fluid dip the wool appeared slightly brighter than that on the other lambs.

The lambs were weighed and the averages of the lots with their increases, was as follows:—

	Average weight on 10th Sept.	Average weight on 21st Oct.	Increase.
	lb.	lb.	lb.
Arsenical powder dip	68·3	84·5	16·2
Carbolic fluid dip	65·0	89·3	24·3
Check lot	59·0	85·0	26·0

As the table shows, the lambs dipped in the arsenical dip did not make the same gains as the other two groups, but the increase of almost ½ lb. per day is satisfactory, and the results suggest that lambs can be safely dipped without ill-effects, provided ordinary care is taken. The test will be repeated next year to ascertain if the lower gain in the lot dipped in the arsenical mixture is due to the dip or to some other circumstance.—E. A. ELLIOTT, Sheep and Wool Expert.

WHY CREAM TESTS VARY.

THE following summary of the reasons why cream tests vary from time to time is given by Mr. E. O. Challis, Superintendent of Dairying, Department of Agriculture of South Africa, in the Departmental *Journal*:—

1. Speed of separator being either too low or too high.
2. Separator running badly through using inferior oil, or bowl vibrating through being out of balance.
3. Removing the milk float and feeding the machine beyond its capacity.
4. Neglecting to alter the cream-regulating screw in springtime, when milk is poor, and in autumn, when milk is richer.
5. Fluctuations in the temperature of the milk.
6. Changes in the richness of milk, either from morning or evening milkings, and more especially through indifferent milking.
7. Amount of skim milk or water used for flushing the bowl, which often varies from day to day.
8. Using a cheap or inferior type of separator.

Wheat-growing in the Parkes District.

W. W. WATSON, "Woodbine," Tichborne.*

IT is only in the past ten years that there has been a determined move by the farmers of the Parkes district to increase their acre yield of wheat. Up to that time a consistent war was waged against the natural forest and the unnatural rabbit, against weather conditions and products that were unsaleable.

During the last few years there has been a decided improvement in the methods of wheat cultivation, farmers having realised that there is much more than the rainfall variations to be taken into account. Many farmers have developed a keener sense of observation, mixed with the ordinary common variety, and we are only now beginning to ask the question, "Why is there any variation in the wheat crop?"

The rainfall registrations of the district call for keen observation and appropriate adjustment of cultivation methods. Taking Parkes as a centre, the figures show that over a period of thirty-six years the variations range from a total of 36 inches in 1891 to 11 inches in 1902, and the month of June, with an average of 256 points as the wettest, followed in order by January, December, July, August, September, March, May, October, April, and then February, with November last, with an average of 142 points. The wheat-growing season of six months (May to October) shows a total of 10 inches, and the summer months about an inch less—a record that calls for good judgment in using to the best advantage the summer rains in relation to the different soils of the district. One of the great difficulties the average farmer has in districts similar to this is to overcome his own conservatism.

A straight furrow twenty-five years ago was the whole evidence of a good farmer, but to-day it is only of 50 per cent. importance. Soil requirements and conditions well understood are worth miles of straight furrows, and many wheat growers of our district have lately learned to appreciate this. They have learned, too, that knowledge without action is dead. Prove your theory by practice, commit your text book to memory, and then plough it under.

It is freely acknowledged now that successful crops can only be produced on fallow, and the introduction of this system of wheat-growing is mainly responsible for the prosperity of the district, and it is seldom that any other cultivation method is submitted to a judge in a crop competition. The entries made in connection with the Parkes P. and A. Association's competitions have in recent years shown a distinct improvement in acre yield, and in the past three years (with a total entry of forty-six competitors) the estimated yield per crop shows a creditable average of slightly over 30 bushels per acre.

* From a paper read at Parkes Educational Tour, October, 1926.

The soils of the Parkes district are of wide range, varying, as they do, from the deep rich chocolate to the light sandy loam, and yet each has its capabilities and must be understood to produce best results. Misunderstanding between the soil's requirements and the grower brings also a misunderstanding between the grower and the banker. We farmers are only beginning to understand our various soils, not only as to chemical deficiency, but also as to mechanical condition.

Problems have yet to be solved as to the needs of the lands lying on the western slopes of the higher country to the east of Parkes. The very excellent response they make in years of average rainfall and under is well known, but there is something in their make-up that, in the wetter winters (which do not come very often) is not a help in the production of heavy yields. This weakness may be their porous nature, which suggests a tendency to lose the effects of applications of superphosphate and other soil necessities by the process of leaching. It will probably be remedied by some system of cultivation and crop rotation, which can only be found by experiment in those areas. However, the excellent returns obtained in eight years out of ten is proof that these soils will maintain their position among the best of the district.

The lands to the immediate west of Parkes and to the north and north-west require their own treatment. Rich, deep, and, in places, heavy clay, they are adding their quota to the maximum yields of the district. On these soils care must be exercised in the working of the fallow, especially during the summer months, but by observing the effects of different cultivations before and after rains the lesson will be learned that nature is trying to teach us.

Further west again we have the wonderfully rich productive soils of Nelungaloo and Gunningbland—strong chocolate, volcanic, producing a rank growth of both grass and crops in seasons of more than average rainfall, but showing less response in comparison in years of low registrations, and especially so in the second year of successive dry years. With a better understanding of the mechanical requirements of the soil, I believe a much better response will be possible in such years, and these lands will yet prove to be among the most productive, if not the best, in the district.

Then we have the lighter soils to the south and the south-west of Parkes, which may not produce the heavy growth of the previously mentioned lands, but will return to the wheat-grower a very payable crop in any year. They, too, need their own method of cultivation on the fallow during the summer and autumn in order to get the best yields.

There are other classes of soils in lesser areas that each require their own method of treatment, but these (with those I have described) can well be classed as first quality, and are all producing yields over a series of years on individual farms and on large areas of from 20 to 25 bushels. With increasing powers of observation on the part of wheat-growers, and acting on what those observations teach, I see no reason why those acre yields cannot be still further increased.

Though our district is comparatively young as a wheat-producing centre, we unfortunately have diseases to combat. The advantage of copper carbonate in better control of bunt and a quicker germination was quickly realised by district farmers, and the experiments of the Department of Agriculture on many district farms proved it so emphatically that to-day its use as a smut-preventive is general and the experiments have been discontinued.

Take-all is not so prevalent in this district as in many others, though traces of it are often met with, and a change to grass or another crop will generally provide the remedy.

Flag smut is our worst disease. It is seldom that a crop of wheat can be found entirely free from it, and many farmers have at times experienced very serious losses, but it is impossible yet to state what is a definite remedy.

Sheep have long been recognised as a valuable adjunct to wheat production, and I know of few farms in the district where they are not recognised as enabling greater wheat yields, saving work on the fallows in aiding consolidation, and restoring necessary components that go to make up a fertile soil, besides bringing into the bank account additional revenue by the sales of wool and fat lambs.

The wheat varieties of fifteen years ago have been superseded by newer varieties which are a contributing factor in the increased acre yield. The greatest area to-day is sown to Canberra, a wheat that has proved itself in wet years as well as dry, and that will accommodate itself to any variety of soil. It is an early maturer and a good wheat to harvest. It may be a little susceptible to disease, but it is the best early-maturing bag-filler we have.

Gresley is also a good wheat, especially as a hay producer. Federation has to some extent gone out of favour here in recent years. It is liable to disease, especially leaf blight and rust, and the wet springs we sometimes get leave their mark on the quality of the grain, for while it holds the pride of place in western Victoria and in similar districts where the spring months are of longer duration, the further one travels in a northerly direction the less it is grown, till in the northern district of this State and Queensland it is almost a stranger. The short springs and the warm, humid conditions of these parts are not conducive to high yields.

Waratah has, during the past year or two, yielded well, and is becoming very popular owing to its good standing and bag-filling qualities.

Bena is also a wheat that promises to become a favourite. Though of only recent introduction, it has an excellent record.

Turvey is one of the wheats that has survived through the past twenty-five years by its ability to stand up against almost every test, and, though a late variety, it figures in most of the crop competitions in this and districts in the south of the State.

Many other wheats are grown by farmers here according to their fancy, but it would be a distinct advantage if the wheat varieties grown could be cut down, and there is a decided inclination on the part of farmers in this direction.

Large increases in the use of superphosphate have taken place in the past few years, due, of course, to the great response that the wheat plant makes to its application. Up to ten years ago it was doubtful whether any benefit was derived from its use. I am not quite sure why this should be, but there are indications that it may be due to the action of sun and rain, assisted by the trampling of stock and the working of implements, causing the consolidation that is so necessary in obtaining the maximum benefit from superphosphate. The quantity generally used is about 56 lb. per acre, but there is a distinct tendency to increase this quantity, as experiments and the crop competitions have shown.

During recent years there has been quite an invasion of tractors to the district, and there are now hundreds at work. Generally speaking, the soils and climate lend themselves to this class of power. The lands are of rather porous nature, and soon dry after comparatively heavy rains, in contrast to much of the soil of northern Victoria and part of the Riverina. Our climate is also suitable for their use, for while we may get a greater yearly rainfall, our total of wet days for the year is slightly less and the tendency with tractors is for a greater area to be cultivated per farm, quicker methods of working when needed, and much less time in taking off the harvest. Whether they will prove an economic success remains to be proved, but the present prices of power fuel point in that direction.

Prices of wheat lands have appreciated in value very much in the past few years, due principally to the more advanced methods adopted in the production of wheat, the realisation by landowners of the productive capacity of their holdings, and the good average prices obtainable for all the products of the farm, and I see no reason why these prices should not further advance to a figure equal to lands with similar soils and rainfall in the other wheat-producing States of South Australia and Victoria.

Wheat has put our district on the map, and wheat will be a big factor in keeping it there, but while we have achieved something there are greater possibilities ahead.

INFECTIOUS DISEASES REPORTED IN NOVEMBER.

THE following outbreaks of the more important infectious diseases were reported during the month of November, 1926:—

Anthrax	5
Pleuro-pneumonia contagiosa	6
Piroplasmosis (tick fever)..	Nil.
Swine Fever...	Nil.
Blackleg	Nil.

— MAX HENRY, Chief Veterinary Surgeon.

A PIG without a pedigree is like a ship without a compass—you never know what may happen, but the chances are you will find yourself upon the rocks.—*Farmers' Advocate* (South Africa).

Bulk Handling and Grading of Wheat.

In Canada and the United States.

Mr. David Kelly, a prominent and popular figure in the Agricultural Bureau movement in the Parkes district, recently returned from a visit to Canada and the United States, and in response to a request from the Advisory Council of the Bureau he has forwarded a report that contains much that is of interest to farmers here.

Noting the differences between the conditions in North America and those obtaining in Australia, Mr. Kelly points out that in Canada great quantities of grain have to be moved long distances in a very short space of time. Harvested in autumn, it is essential that the wheat should reach the Atlantic coast before frozen lakes and rivers block the transport. This could not possibly be done except for the great advantage they have in the abundance of railway rolling-stock suitable for carrying bulk wheat. The whole of the railways there have adopted a standard box car that is used for all purposes other than stock, ballast, or coal. These box cars are admirably suited to the purpose of carrying bulk wheat, and there are several thousands, each with a capacity of 1,500 bushels. The average load for one of their heavyweight engines is forty-five to sixty cars, so that the flow of grain to the terminal elevators is tremendous. The grain is removed from these cars by means of power shovels, by which two men can unload 30,000 bushels per day. This method, however, is being superseded by the car dumper which lifts the car bodily and spills the contents into the receiving bin in a few minutes.

Small country elevators built of wood and holding about 30,000 bushels are used. They are often covered by iron sheets, but in most cases are only painted. These elevators are square in shape, and are subdivided into nine bins by two divisions each way. These divisions are a great support and allow of much lighter timbers to be used throughout the construction. The separate bins allow for grading of wheat as it comes to the elevators. The man in charge can direct the grain into any of the nine bins by making adjustments from the ground floor. The cost of these elevators in America averages about 12,000 dollars, which includes engine, weighing, and tipping plant.

A rapid development of the pooling system of contract selling is taking place, and co-operative farmers' companies are taking control of the delivery of the wheat into the railway cars. In many instances the State Governments are assisting the co-operating companies by advancing 85 per cent. of the cost of construction. The farmers take bonds for the 15 per cent. and appoint their own operators, and work the elevators to suit the rush of harvest operations.

The system of cleaning and grading of wheat as practised in Canada appeared to Mr. Kelly to be elaborate and effective. The varying condition of the grain due to climatic influences was very great and involved the necessity for the establishment of definite grades.

Under the Canadian Grain Act certain standard qualities of grain have been nominated No. 1, No. 2, and No. 3 Northern. These standards were fixed with reference to the soundness of the grain and the protein content. They are definitely fixed (they do not alter from year to year) and indicate to the local and also to the overseas buyer a reliable regular standard of quality, which very greatly assists him in securing the exact quality of grain he wants for his particular purpose. Confidence in buying must affect the price. Certificates are issued to owners of each car load after a very thorough sampling and testing process, which in the rush season is carried on day and night and seven days per week. Each car load is binned according to its grade, and the certificate becomes the negotiable basis of all dealing. If by any circumstance the whole crop was below the permanent No. 1 standard, then no No. 1 certificate would be issued, and in this way a world-wide confidence of great value is being established.

Although the crop in New South Wales would generally average a more even quality than the Canadian crop, Mr. Kelly believes that a system of grading and permanent standards would be far preferable to our present unsatisfactory and varying system of selling f.a.q. He saw a great many samples of wheat delivered from the terminal elevators, and was greatly impressed by the enhanced appearance due to the cleaning process through which it all passed before it entered the storage bins. As the grain is lifted from the car dumps it passes through a cleaning machine which at very little added handling cost greatly increases the attractiveness of the sample and saves the storage room that would be occupied by the roughage. The waste is fairly accurately allowed for in the sampling and testing processes, and is stated on the certificate as dockage. For the handling of car loads that are badly affected with wild oats, there are special machines for removing all these impurities. It is probable that on the average the sample of grain coming from the Canadian threshing machine would be cleaner than from Australian headers. We would therefore gain even more than they do by some similar cleaning process.

An Experiment in Breeding for Production.

At Iowa State College a number of breeding experiments have been carried out in which the value of progeny has been carefully estimated. A scrub cow of the type with which the experiments were started produced under standard conditions 192 lb. of fat, but a calf from that cow, by a pure-bred Friesian sire, produced 266 lb. of fat, and the next generation, in which the same Friesian blood was again added, produced 482 lb. of fat. We cannot get away from the result of an experiment like that. It is borne out in practice, of course, in every dairying country.—Dr. G. F. Finlay, at the recent Conference on Animal Husbandry.

The Marketing of Fat Lambs.

Loss of Weight while in Trucks.

J. M. COLEMAN, Senior Sheep and Wool Instructor.

One of the factors most necessary to successful fat-lamb raising is close proximity to the rail and to market, so that the lambs may reach the market still exhibiting the bloom and sappiness desired by buyers. The necessity for careful marketing methods that will, as far as possible, avoid loss of bloom and weight has often been stressed, but the loss occurring in trucks is unavoidable. Exactly what that loss is and how it varies with the distance travelled we took an opportunity to ascertain this season, by arranging for the average weights of lots of lambs at three experiment farms to be compared with the weights on arrival at Flemington. In each case a sufficient number of lambs was weighed at each end to indicate the average loss over the whole consignment. The table below gives the results of these weighings, which plainly show that an increase in the mileage travelled increases the actual loss of weight, the average loss being correspondingly greater with the mileage. The advantage enjoyed in this respect by farmers in the wheat belt over farmers further out is manifest.

Where bred.	Distance in miles.	Total consignment.	Number weighed	Time trucked.	Time weighed.	Weighed at Flemington.	Sold.	Aggregate weight before trucking.	Aggregate weight at Flemington	Average weight before trucking.	Average weight at Flemington.	Average loss.
								lb.	lb	lb.	lb.	lb.
*Yanco Experiment Farm.	366	200	20	Afternoon 7–10–26	Afternoon 7–10–26	Arrived late 9–10–26 weighed morning 10–10–26	11–10–26	1,866	1,621	93·3	81·075	12·225
†Yanco Experiment Farm.	366	336	35	Afternoon 21–10–26	Afternoon 21–10–26	Morning 24–10–26	25–10–26	3,260	2,878·5	93·14	79·10	13·24
‡Cowra Experiment Farm.	219	100	10	Morning 27–10–26	Afternoon 26–10–26	Morning 28–10–26	28–10–26	948	842	94·8	84·2	10·6
Bathurst Experiment Farm.	141	215	10	Morning 13–11–26	Morning 13–11–26	Morning 15–11–26	15–11–26	916	832·75	91·6	83·27	8·33

* These lambs arrived late on Saturday afternoon and were not weighed until Sunday morning.

† The same remark applies as to time of arrival and of weighing. In this case an error was made at Flemington; 35 lambs only had been weighed at Yanco, but owing to an error which should have little influence on the results, 36 were weighed at Flemington, the marking on the head of one lamb having apparently been rubbed on to that of another.

‡ These lambs were weighed on the afternoon prior to trucking.

The following points are suggested with a view to minimising the loss due to travelling :—

1. Muster and draft as late as possible.
2. Drive some ewes to the trucking yards to hold the lambs together and prevent them from continually "breaking."
3. Exercise care in droving to the yards.
4. Spell the lambs before trucking them.
5. Handle carefully while trucking.
6. Do not allow the lambs to be trucked thirsty.
7. Avoid overloading the trucks.

TUBERCLE-FREE HERDS.

THE following herds of cattle have been submitted to the tuberculin test by Government Veterinary Officers or approved veterinary surgeons. All conditions required in connection with the test and with the scheme for certifying tubercle-free herds having been complied with, the herds are declared to be tubercle-free, and unless otherwise declared this certification remains in force until the date shown in respect of each herd :—

Owner.	Address	Breed.	Number tested.	Expiry date of this certification.
Department of Education	Yanco Agricultural High School.	......	29	14 Jan., 1927.
Walter Burke	Bellefaire Stud Farm, Appin	Jersey..	36	19 March, 1927.
Department of Education ...	Gosford Farm Homes	......	32	16 April, 1927.
H. W. Burton Bradley ...	Sherwood Farm, Moorland.	Jersey..	71	21 May, 1927.
William Thompson Masonic Schools.	Baulkham Hills ..	.. ...	33	15 June, 1927.
Department of Education ...	Mittagong Farm Homes.	......	33	7 July, 1927.
Hygienic Dairy Company ..	Glenfield Farm, Casula, Liverpool.	......	113	15 Sept., 1927.
Lunacy Department ...	Morisset Mental Hospital.	......	14	18 Oct., 1927.
Department of Education ...	May Villa Homes ..	......	6	3 Nov., 1927.
Do do ...	Eastwood Home .	......	10	3 Nov., 1927.
Do do ...	Hurlstone Agricultural High School.	......	47	4 Nov., 1927.
Lunacy Department ...	Rydalmere Mental Hospital.	......	61	23 Nov., 1927.

—MAX HENRY, Chief Veterinary Surgeon.

THE slogan to adopt is "Fallow early, and fallow well; conserve the most moisture."—H. A. MULLETT, Superintendent of Agriculture, Victoria.

Farmers' Experiment Plots.

WINTER GREEN FODDER TRIALS, 1926.

Upper North Coast District.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

THE following farmers co-operated with the Department in conducting winter green fodder trials during the past season :—

V. Brown, Condong, Tweed River.
M. McAuliffe, Tregeagle, via Lismore.
B. Hill, Highfield, Kyogle.
C. S. Oliver, " Laureldale," Casino.
W. A. Parbery, " Corridgeroe," North Dorrigo.
M. McBaron, Riverview, Raleigh.

Owing to the extremely dry conditions during the late summer, early preparation of the land for these experiments was impossible, in most cases ploughing only being carried out just prior to planting. Weather conditions were, however, favourable to good germination, and the plots looked excellent when just above ground. Heavy rain shortly after the crops were up appeared to have a soddening effect on the soil, and being followed by dry weather in early spring, was not conducive to high yields. Particularly was this so at Kyogle, where the oats and barley made practically no growth after the heavy rains. This feature was noticeable with all oat crops throughout the Kyogle district during the past season.

The rainfall during the growing period was as follows :—

	Condong.	Tregeagle.	Kyogle.	Casino.	Raleigh.	Nth. Dorrigo.
	points.	points.	points.	points.	points.	points.
April	1,608	......	......	......	......	604
May	352	577	326	200	360	827
June	883	321	399	379	439	501
July	171	287	193	148	621	550
August	......	......	......	......	65	164
September	......	......	......	......	105	.....
Totals	3,014	1,185	918	727	1,590	2,646

The Plots.

Condong.—Soil, alluvial loam. Previous crop, winter fodders. The land was disc-harrowed after a light shower of rain, and then ploughed after a further fall of rain; disc-harrowed and harrowed just prior to planting. Planting was carried out 30th March, 1926. Germination was good, and the plots made good growth. Harvested 4th August.

Tregeagle.—Soil, red volcanic loam of basaltic origin; very loose and porous, being situated in what is known as the Big Scrub country. In cultivation of such soils an endeavour should be made to obtain a firmer seed-bed before planting than is usually the practice at present. Previous crop, winter fodders. The land was ploughed and harrowed just prior to planting; planted 14th April, 1926. Germination was good, but the experiment was attacked by crows, the young seedlings being pulled up, with the result that the stand in all plots was very thin, while some plots were too poor to weigh. Harvested 17th August.

Kyogle.—Soil, gravelly clay loam; previous crop, oats. Land ploughed early in March, and reploughed and harrowed just prior to planting; planted 22nd April, 1926. Germination was good. The heavy rains shortly after the plants were above ground appeared to have a soddening effect on the soil, with the result that the oats and barleys which were situated below the wheats on a sloping piece of land made practically no growth. The wheat and rye plots were harvested on 9th August.

Casino.—Heavy black volcanic soil, which had been under paspalum pasture for some years. The land was ploughed early during the dry weather, with the result that the grass was easily killed. A second ploughing and harrowing was given just prior to planting. Planted on 15th May, 1926. Germination was good, and excellent growth was made by all plots. Harvested 2nd September.

Raleigh.—Soil alluvial; the land had been under paspalum pasture for a number of years, and was very thickly matted. Ploughing up the paspalum sod was carried out in March; land left in the rough state until just prior to planting, when a second ploughing and disc-harrowing was given. Planted on 14th May, 1926. Germination was good, and all plots made excellent growth. Harvested on 14th September.

North Dorrigo.—Soil, red volcanic loam of basaltic origin, somewhat similar to the soil in the Big Scrub country, the texture being very loose and porous. The previous remarks on cultivation methods in the Big Scrub country will also apply here, in that more effort should be made to secure a firm seed-bed before planting. Previous crops were summer fodders. The land was ploughed and harrowed just before planting, which was done on 25th March, 1926. Germination was good. Wet conditions were experienced during autumn and winter. All plots were more or less affected with soil acidity, with the exception of Black Winter rye, which does not appear to be affected during any stage of growth. Weights were not obtainable from some plots owing to acid patches. In the case of the barleys the whole plots were affected. Harvesting was carried out as follows: Clarendon, Florence and Firbank wheats on 26th July; Gresley wheat, Sunrise and Myall oats, and Black Winter rye on 3rd September; and Mulga oats on 12th October.

RESULTS of Variety Trial.

	Condong.	Tregeagle.	Kyogle.	Casino.	Raleigh.	North Dorrigo.
	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.
Sunrise oats	10 7 1	9 0 0	......	6 8 2	17 11 2	7 10 0
Myall oats..........	10 2 3	7 14 1	......	4 5 3	12 19 3	8 11 2
Mulga oats	9 14 1	5 11 2	......	5 0 0	11 2 3	3 11 2
Algerian oats	9 18 1	......	......	3 11 2	14 1 2	......
Clarendon wheat	7 0 0	6 8 2	5 14 0	9 1 2	12 17 1	......
Gresley wheat ...	6 14 1	10 5 3	5 4 0	6 2 3	7 10 0	5 4 1
Florence wheat	2 17 1	6 7 1	4 14 0	8 18 2	13 10 0	1 17 1
Firbank wheat ...	5 8 2	8 11 2	4 3 0	6 11 2	12 2 3	2 15 1
Black winter rye	9 5 3	10 14 1	2 0 0	8 15 3	7 17 1	7 0 0
Cape barley	Failed.	......	......	5 7 1	6 8 2	Failure.
Trabut barley	Failed.	......	......	5 1 2	4 5 3	Failure.
Clarendon wheat and field peas	10 11 2	5 11 2	7 4 0	9 0 0	15 10 1	5 5 3
Clarendon wheat and vetches	11 5 3	......	6 8 0	8 8 2	15 2 3	3 11 2

From the tables above it will be seen that Sunrise gave best results in the oats, Myall also doing very well this year. Owing to the dryness of the spring, Algerian, which is a late maturing variety, did not give very good results. As a winter green fodder Algerian is probably the most popular variety of oats in this district, it being claimed that it will stand more grazing during early stages of growth than the other varieties.

Of the wheats, Clarendon and Gresley did very well. Florence and Firbank also gave fair results at some centres. Black Winter rye gave very good results throughout the district, with the exception of Kyogle. This crop should prove useful for winter grazing, and should be kept eaten down, as if let grow too high the straw becomes tough, and is not relished by stock as in the earlier stages. On the Dorrigo plateau this crop should be particularly useful on account of its not being affected by the soil acidity. From results obtained in this, and in previous years' trials, barleys are not worth consideration for winter green fodder in comparison with other crops which can be grown.

Manurial trials were also conducted in connection with the above trials, Clarendon wheat being the cereal used throughout.

RESULTS of Manurial Trials.

	Condong.	Kyogle.	Casino.	Raleigh.	North Dorrigo.
	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.
M13 at 182 lb. per acre ...	14 17 1	6 2 0	9 2 3	15 1 2	5 7 1
Super. at 280 lb. per acre...	10 11 2	6 8 0	9 7 1	14 12 3	4 12 3
P7 at 126 lb. per acre ...	10 12 3	4 14 0	9 5 3	16 1 2	......
M5 at 210 lb. per acre ...	11 2 3	5 6 0	9 1 2	14 17 1	......
Super. at 140 lb. per acre...	7 10 0	4 14 0	5 12 3	14 8 1	4 2 3
No manure	7 0 0	5 14 0	9 1 2	12 17 1	......

M13 consists of 10 parts superphosphate, 3 parts sulphate of potash; M5 of 2 parts superphosphate, 1 part sulphate of ammonia: P7 consists of equal parts superphosphate and bonedust.

From the above results it will be seen that superphosphate at the rate of 280 lb. per acre is the most convenient and economical fertiliser to use for winter green fodder crops. The P7 mixture has done very well at Condong, Casino, and Raleigh.

Taking the rainfall received during the growing period into consideration, the best results have been obtained at Casino and Raleigh—particularly at Casino. It has been previously noted that these two plots were sown on broken-up paspalum pasture. The soil thus being well supplied with organic matter had, as well as an extra supply of plant-food, a better water-holding capacity, which is of great benefit to the crop when conditions are unfavourable like those of the past season.

The rate of seeding in these experiments was as follows:—Cereals alone, 2 bushels per acre; cereals with legumes, 1½ bushels per acre; legumes ½ bushel per acre.

The advantages of growing winter cereals for green fodder during late winter and early spring have been demonstrated this year. At present, unfortunately, there is a shortage of feed on most farms as, owing to the continued dry weather, the pastures and summer crops have not come on, while the winter cereals are done.

Under usual conditions in this district, fodder crops at this time of the year are not used. Last year a number of winter cereal crops, not required for feeding, were burnt off. It is in such seasons of plenty that any surplus fodder, particularly wheat or oats, can be cheaply conserved as hay. Even if only a small quantity is stored each year it would prove valuable for feeding purposes when extended dry periods such as the present are experienced.

It is argued by the farmer that the returns obtained from the farm do not permit any expense being incurred in this direction, but generally such expense is only small compared with the amounts usually expended in buying fodders at high market rates during dry periods.

Cleansing of Milking Machines.

Even dairy-farmers who recognise the importance of cleanliness in relation to dairy utensils are apt to under-estimate the care that is necessary to keep milking machines in a perfectly sanitary condition. It is not sufficient to take them to pieces once or twice a week only. The machines should be taken down every day for thorough cleansing, and the releaser and teat cups should be dismantled and cleaned after every milking. Milking machines constitute an important aid to dairying—so long as they are kept clean. The procedure necessary is described in detail in the departmental pamphlet, "The Care of Milking Machines," free on application.

Pasture Improvement and Fodder Conservation.

H. K. NOCK, Nelungaloo.*

YEAR by year the association of economics with agriculture is becoming more universally recognised. It is not the amount of income that marks a man's financial progress, but the excess of income over costs. A £500 income with £200 cost is a better proposition than £2,000 income and £1,800 expenses, and to-day, with mounting costs through tariffs, taxation, insurances, freight, and labour, it has become a matter of necessity that costs should be reduced and production increased. Economy, efficiency, and elimination of waste are essential, for whereas ten years ago a 12-bushel crop would pay the average farmer's expenses and a little to spare, to-day a 16-bushel average is necessary for the same results.

In view of this, we must not under-estimate the importance of farmers having "a second string to their bow." Of course, I refer to keeping more sheep. It is not a big attraction to get 5s. 6d. for wheat, which under average crops and present conditions costs 5s. 5d. to produce, but we must not fail to realise that to graze wheat land profitably at its present price, its carrying capacity must be increased. Thus pasture improvement is a necessity. We must make two blades of grass grow instead of one; and where good grass grows we must grow better. Without suggesting that we should eradicate the old standard native hard grasses, such as corkscrew, wallaby, brome, and No. 10, which have often been a station's standby, I submit that land men generally recognise that these are primarily carrying grasses, and with the extension of the fat lamb industry, with a big and increasing State stock surplus that must be exported, they must be supplemented by more soft and fattening feed to make the animals fit for export, or the next drought will put many stock men in Queer Street. In New Zealand, sheep land values are estimated on the basis of £9 for each ewe and fat lamb it will carry—if two per acre, £18 would be about the market value, and here in New South Wales pasture improvement will unquestionably maintain and improve the value of our land. The chief object is to secure better grass of greater duration, and though methods may differ, it will be found there are three in the main, namely, cultivation, introductions, and superphosphate.

Take cultivation first. At Nelungaloo patches in grass paddocks have been occasionally scratched up with the scarifier, and barley, or even black oat screenings drilled in with superphosphate with wonderful results.

* From a paper read at Parkes Educational Tour, October, 1926.

Relatively the comparison on the cultivated and dressed, dressed but not cultivated, and virgin soil were as 6 : 3 : 1. So I say, "To grow the best feed, break up your land."

Introductions may be divided into two sections—seasonal and permanent. In the former, particularly for the man growing fat lambs, though Wimmera rye is also good, barley and oats are hard to beat, and none but those who have tried them have any idea of their milk-producing and heavy carrying capacity. On heavy myall country and stubble land, it is often possible to put seed and superphosphate in with the combine without any other cultivation. Areas of each sown in early autumn with 56 lb. superphosphate will often give germination in a warm seed-bed with the first decent rain. Next protect it; stock relish young cereals, so to get the best feeding, let it get well established (say 6 inches high) before you use it. Nothing comes faster than the barley—Cape for preference. Nothing is sweeter, and after reaching this stage it will carry eight to ten sheep per acre for a considerable time. By the time it is bared down the oats will be ready, and by changing from barley to oats and back, the lambs and their mothers can be kept in their prime. Should a bountiful season make them surplus products, the silage pit, or the binder or header can be brought into requisition for their conservation. Coming to spring you can plant Sudan grass, but remember the Sudan-sorghum hybrid when young is as dangerous as young sorghum, so be sure only to plant pure Sudan grass seed. A small paddock of this, when grass seed is bad, is particularly valuable, and almost means new life for shorn weaners. Late suckers topped on this, though shorn, brought 21s. 6d. even in the slumped Sydney market of last December.

Coming to the permanent section, in our coastal districts, clovers and introduced grasses have revolutionised these lands, and though each district soil and climate must necessarily limit us, I am convinced that the numerous and valuable fodders of our wheat areas can with advantage be supplemented by some introductions.

Take lucerne, the king of fodders, for a start. Can you value green feed in summer? How quickly does lucerne come after rain? How often has a green picking saved the lives of sheep dying from impaction? It will not grow on rock, it will not grow where it is not planted, but give it a chance elsewhere; a fine seed-bed, for preference in warm districts, and autumn sowing with the opportunity for root growth before the summer, are the first steps. When established, remember that on our wheat lands it must be treated as a grazing proposition, and care must be taken not to eat it out. Feed off quickly, then close out the stock. When again ready (usually in two or three weeks) repeat the process.

The Agrostologist of the Department of Agriculture has proved that *Phalaris bulbosa,* which is a great grass on the Tablelands, is well worth

while on the western slopes. Soft, palatable, fattening, and drought-resistant, this vigorous grass comes fresh with each rain, and will make inches of growth in the autumn, while most annuals are but striking their roots. Being a stooler and prolific seeder, it is quite an acquisition to our varied and valuable feed, and when I tell you that the price of seed was 6s. per lb. this season, you will appreciate the increasing knowledge of its value.

Another plant which improves on acquaintance and has made great headway this year is Subterranean clover. Though only an annual, it is a heavy seeder which plants its own seed, and when once established can to some extent "paddle its own canoe" among dense thistles and tall grasses. In dark and shady places, where other clovers grow pale, Subterranean clover keeps its dark rich green. Its seed pod does not stick to wool, and on sour ground, hill slopes, and among dead timber Subterranean clover and superphosphate will quadruple the carrying power. I venture to predict that from Cookamidgera east, in years to come there will be thousands of acres of this wonderful clover. Of course, in establishing grasses, a mixture is often advisable, and the plants mentioned, *Phalaris bulbosa*, lucerne, Wimmera rye, and Subterranean clover, mixed and drilled with superphosphate should be quite satisfactory.

Now for our summer grass. Sudan is an annual, but *Panicum antidotale* (Giant Panic), and Coolah grass are perennial. The first, an introduction by the Agrostologist of the Department of Agriculture, from the Northern Territory, grew over 8 feet here last summer, and produced ½ cwt. of fodder from two roots, and this season has grown nearly 18 inches in the five weeks since the frost. The field areas of this grass are much relished by stock; it can be easily grown from seed, and with its bamboo-like root growth will stand a most severe drought.

Coolah grass, though not nearly so vigorous, adds variety, provides good feed, is well worth a place, and, like all others mentioned, is quite free from injurious seed.

I now come to superphosphate. Twelve years ago hardly a farmer in this district used superphosphate to grow wheat. To-day hardly a farmer tries to grow wheat without it. The superphosphate that grows wheat will grow grass, and though to-day it is only the odd farmer who puts it on the pasture, it is not unlikely that in twelve years time much land will be too dear to graze without it.

The careful man will ask, does it pay? The answer to this necessarily depends on the value of the grass. Taking western lands with a grazing value of 2s. per acre, doubling its grass at a cost of 3s. would appeal to very few, but on agricultural areas and high-priced grazing lands it is altogether different, and the proposition is highly payable.

Every farmer now knows that the action of superphosphate is not only to feed but to stimulate; consequently pasture dressed in the autumn comes

away quickly immediately after the seasonal autumn rains. This is the first advantage. Next, the feeding quality is vastly improved, and, thirdly, it greatly increases the bulk of feed.

To calculate the added value, these three points must be weighed. First, the early feed. In almost any market it is "the early bird that catches the worm," and the fat lamb business is no exception. Next is quality. Sweet grasses that fatten are always the most valuable, and whereas corkscrew, No. 10 or wire grass, and wallaby have not yet shown much advantage from top dressing, the softer fattening varieties which oftimes struggle among them get help to hold their own, and the vigorous healthy growth of the trefoil, clovers, and other soft herbage make them ever welcome to stock; observant farmers will find that in partly-dressed paddocks stock will give their own testimony with regard to palatability, and indicate their preference by their continuous and almost exclusive attention to the portions dressed.

The third point in its favour is in regard to quantity. Private experiments in 1924 and 1925 on areas where strips were missed for purposes of comparison, showed distinctly that the application of 56 lb. per acre of standard superphosphate produced three times the body of grass and burr clover grown on the undressed strips. Of course, seeing is believing, and the way to see your grazing value trebled is to try a small patch for yourselves.

For some years past the New South Wales Department of Agriculture has demonstrated the value of superphosphate as a top-dressing for pastures, and in Victoria and South Australia top-dressing is well through the experimental stage, but there are thousands of holdings in New South Wales the carrying capacity of which could be doubled by the use of a few tons of superphosphate, and the sooner our landowners realise it and adopt the system generally the sooner will they obtain the profits which await them.

Pasture improvement, of course, has an essential companion in fodder conservation. It is easy to realise that, having in ordinary circumstances doubled the carrying capacity, and having doubled the stock, the risk is likewise doubled when drought comes.

Few people appreciate the real monetary value of the security. They say, "Five years ago I put £100 cash into the production and erection of that stack. I have paid £10 insurance on it. Look at it now. If I sold it I would not get back £30." Stock broke through the fence, hurricanes and wet and mice have all done their damage, and he thinks he has lost £80, but in reality he has probably made £300 or £400 through the possession of that stack. Each of those five years he has been game to stock to the carrying capacity of his holding because he knew he was safe. One hundred extra ewes would return him the full cost of the stack in one year; instead of wasting part of his grass he has used it, and has not lost sleep with each temporary dry spell. It is not essential that a man either use or sell his stack to get his money back.

The Root, Stalk, and Ear Rot Diseases of Maize.

SUGGESTIONS FOR THEIR CONTROL.

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor, and
W. H. DARRAGH, B.Sc. (Agr.).

DISEASES which cause a rotting of the roots and stalk and also affect the ear and grain have been observed to be present in maize crops throughout the State for some years. They appear to be so much on the increase that it is felt that some attention should be drawn to them, so that farmers may undertake measures for their more effectual control.

Last season (1925-26), which was not as favourable for maize production in New South Wales as usual, the losses caused by these diseases were estimated at well over 5 per cent., and in some parts of the State (particularly the North Coast) it was estimated that the loss was greater than 10 per cent. of the potential yield, which can be reckoned to be much greater than the loss from all other diseases of maize together. The diseases under discussion are distributed right throughout the State, and it is practically certain that no maize crop in New South Wales is entirely free from them. It also seems certain that they are already distributed throughout Australia.

The loss in yield is caused by: (1) Loss in germination or stand; (2) reduced vigour of growth in diseased plants; (3) loss from lodged or broken stalks; (4) loss of weight in grain from improper filling (on account of premature ripening of stalks); and (5) actual injury to grain.

These diseases have been observed in 100-bushel crops, which in some cases they have been estimated to have reduced by at least 10 bushels, so that no farmer should delude himself with the idea that because of a good crop there is no need for him to bother about measures for their better control.

Cause and Characteristics of the Diseases.

These diseases have been identified as being due to the fungi *Fusarium* sp. and *Gibberella* sp. The *Fusarium* fungi commonly pass through another stage in their life history, in which they are more definitely identifiable, and the probable life history of these diseases is that the *Fusarium* stage, which is easily identifiable from diseased roots and stems of the growing plant, changes to a *Gibberella* stage on dead maize stalks which lie on the ground during the winter and on which the perithecia or spore-bearing bodies are readily observable with the naked eye as small black excrescences about the size of a small pin's head near the nodes of the stalks. The *Gibberella* spores probably germinate in spring or summer and give rise to the *Fusarium* stage, which infects any tender growing part of the plant and also actually injures the grain through the silk, giving rise to a split

condition of the grain, which swarms with *Fusarium* spores, or which sometimes becomes disguised by an overgrowth of mycelium with which may be associated the characteristic lavender colouration of this fungus.

Infection of the stalk may also take place from the fungi in the soil or from the mycelium present in the seed. The injury to the plant is generally most marked in the roots, which often rot completely away, and the stalk then lodges easily. Such stalks are easily pulled from the ground because of the rotted condition of the roots. In other cases the disease makes further headway in the inner tissue of the stalk, which may be almost completely rotted for the height of a few nodes above the ground. This rotting of the stalk is not readily observed. The hard outer tissues are not so easily attacked by the fungi, and infected stalks often appear quite sound until they become so weak as to break over. This more often applies to tall growing crops in coastal districts than to the shorter crops of the tablelands and western slopes. The best guide as to how far disease has progressed in a stalk is usually the amount of root hold it possesses. When the stalk pulls up easily the disease has usually rotted most of the roots and has progressed some distance up the stem. Such stalks show the effect of this invasion by the fungi by their premature ripening and pinched or loose grain. It seems certain that pinched grain in an otherwise good crop is largely caused by the diseases affecting the roots and stalks of certain plants in this way, cutting off their moisture and food supply when they are filling their grain. Many farmers have resignedly attributed pinched grain to dry weather in some obscure way, though they have never been able to explain why certain plants should suffer more than others in the same field. Likewise the lodging and breaking of stalks was attributed by many farmers mostly to wind and weather, an explanation which does not suffice when some plants are down badly while others stand erect. The diseased condition of the root and stem largely supply the reason for this also.

It is thought that the progress made by the disease up the stem depends largely on the method of infection of the young plant. It is natural to suppose that in the case of an infected grain—it is known that the grain can carry internally the mycelium of the fungi—the disease is likely to make more headway in the plant than if infection has to take place through the root tissue by chance contact with the fungi in the soil. It is seldom found if the stem is diseased that the roots are healthy, while if the roots are diseased the fungus spreads in most cases, at least through the lower part of the stem, though the distance it traverses up the stem varies greatly in different stalks. It sometimes occurs that the roots and the lowermost part of the stem are badly rotted and that brace roots are put out from the nodes above the rotted part of the stem, which take a firm hold of the soil and help to maintain the plant firmly in the ground until it secures the nourishment it requires to mature a plump grain. In other cases, one node after another is apparently quickly overtaken by the disease in its passage up the stem, and the corresponding brace roots at these nodes

become useless to the plant until the nodes not reached by the disease are so far above ground that the brace roots they put out do not reach the soil.

The stem may become infected through the tender ear shoots behind the leaf sheaths at the nodes, and infection may spread from these points or from the base of the plant to the ear, or this may become infected directly itself when young and tender from spores flying about in the field during the growth of the crop. In the case of systemic infection the mycelium of the fungus goes into the seed and serves to carry the disease over into the next crop.

Secondary direct infection of the grain and actual injury to it may occur through the silks from flying spores, and this visible infection is apparently becoming more marked in maize crops throughout the State. The characteristic splitting of the grain which this infection gives rise to is by no means well known to farmers, nor is it connected by them with the root and stem rot condition of the plant; but it seems likely that much of the disease is carried forward to the subsequent crop in this way, as well as through invisible internal mycelium in the seed and by the fungus in the soil. Visibly affected grains on an ear are swarming with spores (though such grains will germinate) and these spores also become attached to the other grains. Any ears which show any sign of secondary infection on the grain should be discarded for seed, no matter how good they are in other respects.

A Bad Case of Fusarium (splitting) disease of the Grain. Even a slight indication of this disease should be avoided in seed selection.

Symptoms in Early Growth.

In view of the fact that the disease is carried over in the soil, the careful avoidance, where possible, of the sowing of infected grain may, at first sight, appear futile, but study of these diseases reveals that time is apparently a considerable factor in the headway made by the disease in its systemic infection of the seed through the plant, and it may be supposed that already-infected seed would give rise more quickly to a diseased plant than would chance infection from the soil. Moreover, every infected seed will give rise to a diseased plant, while clean seed may after all grow into a plant which escapes infection from the soil. Probably 50 per cent. of the plants in an ordinary crop are not affected with the disease, and this would not be the case if seed already infected (visibly or invisibly) were sown. But the greatest difference, it is thought, between plants

grown from infected seed and plants infected through the soil is in their early growth. There is no doubt whatever that these diseases are the cause of more poor germination and bad stands in the maize fields throughout the State than any other factor, and most of this failure in germination or stand is from unconsciously sowing infected seed rather than from early chance infection of the young plants from the soil. Many maize-growers must sow maize on the same land year after year, and it may hearten them to know that they are probably doing less harm by continuous maize culture than by insufficient attention to seed selection as far as these diseases are concerned.

With the usual method of planting maize three grains together, a 75 per cent. germination (appearance of the stand in twos and threes) is not regarded as amiss, yet under favourable conditions clean seed should germinate at the rate of over 90 per cent., and when under good conditions the poorer stand is obtained the farmer can be assured that diseased seed is largely the cause.

Although many slightly infected seedlings may re-establish themselves by pushing out new roots from the nodes above the infected parts, as described, such plants never recover properly from the handicap they have suffered during their early growth. While the disease is present in the stalk it seizes on the least lack of vigour arising from unfavourable conditions to make further headway, and the yield or productivity of every plant attacked by the disease at any stage is more or less affected. Later on, when the crop has grown a few feet, little or no sign of disease is evident, except that on poor soils or under dry conditions a badly affected crop will be observed to be very irregular in height and growth. When scattered plants in the field rather than a certain spot in the field on a hot day wilt appreciably sooner than others it is usually an indication that root and stem rot diseases are present.

Symptoms in Later Growth.

About the tasselling stage the disease is not very evident except for a tendency in badly affected plants for the uppermost leaves to start dying off. This condition differs entirely from the "firing" of the bottom leaves of the plant due to lack of moisture or plant-food or the natural dying of the leaves—the lowermost first—as the plant matures. Some leaning of individual stalks here and there through the crop due to the diseased roots also occurs at this stage. Later on, at the ear stage, diseased plants are more readily indicated by the premature dying of the top leaves, which is followed by the dying of all the leaves and the premature ripening of the ear, in which the grain is generally observed to be pinched or not as plump or as fully developed as the average of the crop. Odd blown-down or broken-down stalks are suspicious and are generally found to be diseased in the roots or the stalks or both. When stalks are blown down or broken through rain and wind, without disease being a contributing cause, the crop is usually affected in spots or whole patches, but every maize-grower knows well how odd stalks are lodged or broken throughout the crop, and this

condition is now mostly found to be the result of these root and stalk diseases. Broken or rotten shanks are sometimes observed, and any ears which hang straight down instead of bending or turning down naturally are to be looked on with suspicion.

The characteristic splitting of the grain across the crown or dent end, either accompanied by *Fusarium* spores or by mycelium, has been described. Some ears show a splitting across the back of the grain, which has also been found to be swarming with *Fusarium* spores. Still another condition —a dark discolouration of the dent or crown accompanied by much dead tissue at this part of the grain—leads, in the light of other observations, to the conclusion that this secondary infection has taken place through the silk rather than that it is a systemic infection of the grain through the plant.

Systemic infection of the grain by mycelium from the stalk is practically impossible to detect, yet it serves to carry the disease over more insidiously than secondary infection, which can be readily seen. Some guide as to whether the seed is infected by internal mycelium is obtained from the character of the shank when the ear is broken from the stalk. A break which is not clean but shredded or stringy in appearance is an indication that the fungus has progressed into the ear, and a dark or brownish discoloration or softness of the core is also a fairly sure sign of the disease.

CONTROL MEASURES.

Close observation and reasoning are necessary to arrive at worth-while measures for control. Suggested methods may be described under the following headings. Some of these recommendations are entirely practical and should be applied by maize-growers at once.

Control by Seed Selection.

Field Selection.—From what has already been stated concerning these diseases, it is apparent that the best control will be afforded by the selection of seed ears from the standing crop, examination of which will reveal a great difference in the incidence and severity of the disease on individual stalks, some stalks (sometimes up to 50 per cent.) being apparently quite free from the rot. The insidiousness of these diseases lies in the fact that apparently quite sound ears can be produced on diseased stalks—probably having matured before the disease makes sufficient headway in the roots or stalk to affect the filling of the grain. But after the crop has ripened, and especially after frost with bright days following, the stalks and especially the shanks and ears are invaded rapidly by the disease and the seed of apparently sound ears with plump grain may become infected by the mycelium of the fungus. In such seed, selected in all good faith by ordinary methods and standards, the viability (or germinating power) is at once reduced, the vigour or growth of the seedlings or young plants grown from it is greatly lessened, and the resultant plants are probably badly diseased.

By field selection ears from diseased stalks which are lodged or broken are, of course, easily avoided. Many such ears are chosen for seed when selection is done in the barn after harvest.

The purpose of brace roots on the maize plant has never been properly understood, but in view of the distinct tendency to their development, which has now been found to be associated with a rotted condition of the ordinary roots or lower part of the stem, these brace roots must be looked upon with suspicion. Broken or rotted shanks are also generally an indication that the disease is attacking this part of the plant, though many

Root and Stalk Disease of Maize.
The three stalks on the right are sound and healthy.

shanks become broken on the North Coast through the boring or tunnelling activities of the caterpillar of the yellow peach moth. Prematurely ripened stalks should be regarded as very suspicious, especially when any attempt is being made by field selection to develop an earlier maturing strain of maize, and care should be taken to distinguish between natural and premature ripening.

The selection of seed maize in the field becomes of far greater significance than ever with the advent of these diseases, and there is no better means of satisfactory control apparent at present. It is almost impracticable to

select sufficient seed in the field for sowing a large area, but small maize-growers will find it to their advantage, while larger producers may easily field-select sufficient seed to sow a few acres as a special seed area, continued field selection from which will improve the standard of the farm crop.

For better control of these diseases by field selection the points may be summarised as follows:—

1. Avoid even sound ears from diseased stalks. The ease with which a stalk pulls from the ground generally indicates the stage of development of the disease.
2. Do not select ears from lodged or broken stalks or from stalks with rotted or broken shanks.
3. Avoid ears from prematurely ripened stalks.
4. Regard brace-rooted stalks with suspicion.
5. Select seed early to more largely prevent mycelium of the fungus penetrating the seed by systemic infection.
6. Dry seed ears quickly by storing in a dry, warm, well-ventilated place in an endeavour to prevent the fungus making further growth from the core into the seed.

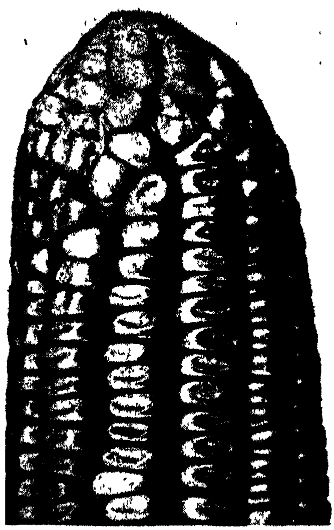
Barn Selection.—Although barn selection cannot be regarded as having the value of field selection in the control of root and stalk rots of maize, it cannot be overlooked that many farmers, especially on large areas, will adhere to the plan of selecting their seed from the shed or barn after harvesting. It is necessary, therefore, that some advice should be given for the better control of the disease by barn selection.

Investigations have been made to determine whether there are any visible characters of the ear or grain which indicate the presence of the disease or are correlated with any tendency to carry the disease or any susceptibility to attack. Fortunately some help can be given in this direction to the maize-grower who depends on barn selection.

Ears containing any split, mouldy, or darkened grains which are characteristic of the secondary infection by this disease through the silks should be rigorously avoided. It is not sufficient that badly damaged ears be thrown out or that the few infected grains be picked out of a slightly damaged ear. One damaged grain on an ear swarms with spores and is capable of infecting a large quantity of seed in the operation of shelling. It has been explained how systemic infection of the grain can take place by the fungus growing up through the stalk, and it might be assumed that in some cases there would be evidence of this in the shank when the ear is broken from the stalk. Such is often the case. Ears with shredded, stringy or discoloured, especially pink-coloured, shank attachments should be discarded, regardless of their otherwise desirable characters for use as seed, for the grain from such ears is almost sure to carry internally the mycelium of the fungus and infect the subsequent crop. Likewise any ears which shell grain with a stringy tip cap should be discarded.

At Grafton Experiment Farm in 1925 seed from ears with a clean shank attachment yielded 57 bushels per acre, while seed from ears with a slightly shredded shank attachment gave a yield of 54 bushels per acre.

Ears which have pinched or badly filled grain will generally be avoided, but the farmer who wants to control root and stalk diseases of maize better must regard any slight lack of plumpness of the grain or looseness of the grain on the cob as highly suspicious when plump or firm grain can be obtained from the same crop. Loose or unfilled grain may indicate that the roots or lower part of the stem of the plant are so rotted that the sap-carrying vessels are broken down or filled with fungus mycelium, thereby causing a premature ripening of the grain. At Grafton Experiment Farm in 1925 ears with firm grain on the cob yielded 3 bushels more per acre than ears with moderately loose grain.



Secondary Infection of the Grain at Tip of Maize Ear.

In this case infection took place through the silks by *Fusarium* sp.

It has also been found that deep, dull coloured soft starchy grain with a rough dent has a greater tendency to carry the disease or to produce plants susceptible to attack than bright, medium horny grain of good weight. This is rather an important point in selecting any variety of maize to a better type, apart from the question of better control of root and stalk diseases. In a test at Grafton Experiment Farm in 1925 with Fitzroy, grain from rough dented ears gave a yield of 49 bushels per acre, while grain from moderately rough dented ears yielded 57 bushels per acre. The cardinal principle in the selection of seed maize—namely, the selection of ears which are heavy in proportion to their size, as usually

containing sound, heavy, plump grain—cannot be over emphasised, whether from the standpoint of disease control or of improvement in yield and quality.

Germinator Selection.—In America, where this disease is also prevalent, the germination test of grain from ears chosen preliminarily for seed has been advocated. The following statement appears to reflect the almost general experience in that country:—" The germination test (of 6 or 10 grains from each ear) when conducted carefully and interpreted properly is a very valuable further aid in the selection of the very best ears. By its use, most of the diseased and weak ears which are not eliminated by physical selections can be detected."

So far no encouraging success has been obtained with this method in New South Wales, but investigations are being continued.

Control by Cultural Treatment.

Burning of Stalks.—The burning of the maize stalks is an operation which has not been looked on with much favour by farmers who relied on them to help to maintain the organic matter of their soil, but in view of the increase in the incidence of root and stalk disease and of the large numbers of spores which are carried over on over-wintering maize stalks, it seems that the burning of the stalks will have to come more largely into favour, and that some form of green manuring will have to be resorted to for the maintenance of organic matter. The destruction of large numbers of *Gibberella* spores by burning the stalks must cause at least an improvement in the amount of secondary infection or actual damage done to the grain by this disease.

Rotation of Crops.—Continuous maize growing cannot of course be avoided in some districts, but wherever possible a rotation or change crop should be introduced. *Gibberella* sp. has been identified by Mr. H. J. Hynes, of the Biologist's branch, from oats on Grafton Experiment Farm, and it is a common parasite on wheat in America, where it causes " wheat scab," a gumming together of the glumes and grain, so that these crops cannot be regarded as of much value in the rotation for starving the parasite. As far as it is known, no other crops but maize, oats, and wheat are attacked, so that any others are of value as change crops.

Time of Planting.—Investigations which have been carried out on these diseases in America have shown that when the incidence of the disease is caused by chance infection from the fungus in the soil, there is a difference in the amount of infection of seedlings according to the temperature. It has been found that maize seedlings are more readily attacked at low temperatures, and remain more healthy at temperatures above 75 deg. Fahr., while wheat seedlings blight more at high temperatures and are more resistant when grown below 50 deg. Fahr.

An interesting explanation* is given of this phenomenon, and, though technical, is worth repetition here.

*Dickson and Holbert, *Jour. Amer. Soc. Agron.*, April, 1926. Eckerson and Dickson, *Phytopathology*, vol. 13, p. 50, 1923.

A study of the development of the seedling blight of wheat and maize indicates that the development of the disease is primarily concerned with—

(1) penetration of the fungus through the protective sheath tissues;

(2) favourable substances for active growth when once within the tissues.

In other words, the influence of temperature on the development of seedling blight of wheat and maize is primarily a host response, and therefore a study of the host plants should reveal something of the nature of these differences.

"The metabolism of wheat and corn seedlings is influenced differently by temperature. Wheat seedlings grown at low temperatures (8 deg. Cent.) are high in carbohydrate building substances, and have cellulose cell walls. The wheat seedlings grown at high temperatures (16-24 deg. Cent.) are relatively low in these building substances and have a high pentosan content. . . . On the other hand, corn seedlings grown at low soil temperatures (8-20 deg. Cent.) are relatively low in these soluble carbohydrate building substances, and have cell walls, especially in the protective sheath tissues, composed largely of pentosan yielding substances giving the characteristic reactions of pectic materials. The corn seedlings grown at high temperatures (24 deg. Cent. and above) have a large reserve of soluble carbohydrate building substances, principally sucrose, glucose and fructose, and have cellulose walls well impregnated with suberin in the protective sheath tissues.

"Fungus penetration is largely inhibited by cellulose cell walls reinforced with either lignin or suberin, and the hexoses and other soluble polysaccharides found in either wheat or corn seedlings are relatively poor foods, whereas the pentosan yielding substances such as pectin and xylan are excellent foods and produce five times more vegetative growth of the fungus than the simple sugars. Consequently the conditions found in the seedlings at the different temperatures indicate a direct correlation between host metabolism and the development of seedling blight."

From this it appears that a delayed or late sowing of maize, where this is possible, may be expected to produce a crop which is not so badly attacked by this disease, at least in the early stages.

Control by Seed Treatment.

It would naturally seem at first futile to treat seed maize with any specifics when the disease is carried over in the soil, and more so when the mycelium of the fungus is carried internally in the seed, and the usual specifics are therefore of no practical value. Recent investigations in America with some of the recently discovered mercury-phenol compounds have shown, however, that some of these have possibilities in the treatment of seed carrying internal fungi. In the case of the root and stalk diseases of maize it has been mentioned that seed carrying the fungus probably causes far more damage than the chance infection from the soil, and any seed treatment which gives promise is worth encouragement. It has been

found in America that some of these mercury-phenol compounds are useful in treating seed which is known or suspected to be badly diseased, but not of much value in the treatment of apparently healthy or not badly diseased seed.

Further tests are being made with one of these compounds in New South Wales. Other seed treatment is also being investigated.

Control by Breeding.

It has been definitely established in America that by continued self-fertilisation it is possible to produce pure strains either resistant or susceptible to root and stalk disease. The disease resistant strains are capable of growing under unfavourable environmental conditions in heavily infected soils and still remaining healthy. It has also been shown that resistance of the root and stalk rot is an heritable characteristic, and that first generation hybrids between resistant and susceptible strains are susceptible to the disease at all temperatures. That is, susceptibility is dominant in such crosses. If, therefore, two resistant strains are crossed the resultant hybrid will be resistant to the disease.

Pure line or strain work with maize has been commenced at some of our experiment farms in New South Wales, and this phase will be watched with interest.

Conclusion.

The matter contained in this article is put before farmers in the hope that they will appreciate the nature of the root and stalk rot diseases of maize, which up to the present have been probably imperceptible or, if observed, not understood. Much remains to be discovered concerning them, however, and further investigations are being carried out.

Why Pneumonia is Prevalent Among Pigs.

Why is pneumonia such a prevalent disease in pigs, and can we control it? My opinion is that it is prevalent because we do not as a rule make the slightest attempt to protect the pig properly. Consequently, we can control it if we go about it in the right way. Take the ordinary piggery on the coast. The animals are usually herded in a small yard, which is never cleaned, and which has been used as a sty for generations. The pig-house is often not a house at all, but just a piece of tin placed across the corner of the fence, or an old tank that is past its usefulness as a reservoir for water. As for the floor, it is generally conspicuous by its absence, but if there is any floor at all it usually takes the form of a few loose slabs thrown anyhow on the ground. Very rarely are the walls of the sleeping shed proof against weather and draughts. Under these conditions the pig is expected to live and thrive!

Is it surprising that pneumonia is such a prevalent disease? As a matter of fact, in 90 per cent. of the piggeries I have seen in the last twelve months I have found pneumonia or signs of pre-existing pneumonia among the pigs, and I am convinced that it was due in the first place to the faulty hygienic conditions under which the pigs were kept.—W. L. Hindmarsh, District Veterinary Officer.

VAGINITIS IN DAIRY COWS.

WHERE you have cattle which are constantly returning to the bull, but which do not breed, in 90 per cent. of the cases lesions of vaginitis will be found. You will find that the vagina is inflamed, although the inflammation varies considerably in extent. You may find only a very small inflamed area round about the vulva, or the lower angle of the front of the vagina, or you may find it in the upper part. In other cases you will very often find it extending right through the vagina. In appearance it looks as if there were little grains of sand underneath the membrane of the passage.

I cannot tell you of a cure for this condition, but the majority of the cows will go in calf if you wash them out over a period of four or five days with a disinfectant, such as lysol, or some disinfectant which has a soapy basis, that is to say, which becomes frothy when mixed with water. Do not use a mercurial disinfectant, like corrosive sublimate, and what you do use, use weak in large quantities; it is far better to use two or three gallons and to wash the cow out thoroughly with a foot-pump than to use a strong solution in a lesser quantity. If you use the disinfectant at all strong you will make the condition ever so much worse; 2 per cent. of lysol is quite strong enough. Then, just before the cow goes to the bull, wash it out with bi-carbonate of soda (or baking soda), a tablespoonful to a gallon of water. If you use that treatment you will find that a considerable number of cows that were not breeding will then take the bull successfully.

I do not agree with "opening the passage" unless the person concerned has some knowledge of anatomy--I have seen considerable damage done by persons using instruments in this connection.—W. L. HINDMARSH, District Veterinary Officer.

"AUSTRALIAN INTENSE VEGETABLE CULTURE."

THE author of this book, Mr. James Conarty, has been a very successful grower of vegetables and a prominent prize-winner in the vegetable sections at exhibitions in Western Australia, and the incorporation of his experience in a book of 160 pages, well illustrated, is sure to be welcome with those who are interested in the culture of vegetables under intensive conditions.

"Miscellaneous" is a title usually reserved for the "all and sundry" kind of thing at the end of a book, but Mr. Conarty makes it the title of his first section, and under that heading states the general essentials to success, such as aspect, soil, drainage, trenching, cultivation, rotation, mulching, watering, fertilising and manuring, sowing, hot beds, cold frames, transplanting, and so on. The second section deals with insect pests and fungus diseases, the third with the treatment necessary to a great number of individual crops, and the last with the growth of culinary herbs.

The book would have gained by a little improvement in display, but it is packed full of information and is a welcome addition to Australian vegetable-growing literature.

Our copy from the publishers, Albert and Son, Ltd., Perth, W.A.

A New Drench for Stomach Worms in Sheep.

EXPERIMENTS AT HAWKESBURY AGRICULTURAL COLLEGE.

F. WHITEHOUSE, B.V.Sc., Government Veterinary Officer.

In transmitting this article for publication, Mr. Max Henry, Chief Veterinary Surgeon, remarks that it deals only with experimental work carried out at Hawkesbury Agricultural College. The drench described was elaborated under special circumstances and under the conditions existing at the College and has been found highly satisfactory. It should be borne in mind, however, that at the College expert assistance in preparing the drench is always available. For ordinary flock purposes the more easily prepared and less risky copper sulphate and mustard drench is considered the most satisfactory one in vogue at present.—Ed.

THERE are several kinds of stomach worms in sheep, but one of the commonest is the wire worm (*Haemonchus contortus*), which is so small that very few farmers can distinguish it even when it is present in hundreds in the sheep's stomach. Infestations of sheep occur in all parts of the State, excepting the far west.

The economic losses occasioned by it have been, and are, enormous, and its ravages on the coastal areas of this State have been so great in the past as to drive all pastoralists inland, and it looked at one time as though the stud at Hawkesbury Agricultural College would follow.

Within the last four years, however, the flock of Romney Marsh sheep has been more than doubled, and the stud is now a source of gratification to the Department. The change has been due to better management of the flock, better and more varied feeding, better drenching, and the appointment of a sheep and wool instructor. It is proposed to discuss in this article the improvements in drenching.

Effect of the Parasite on the Host.

Sheep of all ages are susceptible, though the heaviest mortality occurs among lambs and weaners, especially those naturally weak. Sheep suffering from stomach worms become weak, haggard, unkempt, the fleece elevated and often dirty and displeasing to the trained eye of the pastoralist. Appetite is at first increased, but later is in abeyance, and ultimately rumination ceases. An affected sheep takes little interest in its surroundings, lags behind the flock, and is emaciated. The belly sags, the flanks fall in, and the haunches and pin bones become prominent. Often "bottle-neck," a dropsical condition of the space between the branches of the jaw, is observed. Diarrhœa may be existent, in which case the crutch is usually dirty, so-called "dags" hanging from it.

The attendant finds little difficulty in catching the sheep, which often stumbles in its attempt to get away. It feels very poor, the bones are prominent, and little flesh can be felt on the back or ribs. The fleece is dry,

there is little yolk, and on separating the wool the skin is seen to be very pale (anæmic). The eye is glassy and the conjunctiva anæmic. The sheep usually pants very much on being caught, and may collapse.

These symptoms are resultant on loss of blood, absorption of toxins from the true stomach and intestines, and the invasion of the body by germ life from the digestive tract owing to minute abrasions in the mucous membrane.

Depraved appetite leads to the ingestion of earth, which seriously complicates matters, often hastening death.

In order to confirm the diagnosis, post-mortem examination may be undertaken in the paddock. Place the dead sheep on its back with the four feet in the air, and make careful incisions from the breast bone to the anterior point of the pelvis, and from a point 6 inches or so in front of this down each side to the haunch bone. The internal organs will be found to be very anæmic, and on opening the U-shaped fourth stomach and holding the contents as still as possible, the observer will notice movements within it, due to the presence of hundreds of worms difficult of vision to the naked eye. If a teaspoonful of contents be now placed in a tumbler nearly full of water, the worms will be readily discernible.

They are white wire worms, and vary in size from ½ inch to 1 inch, occasionally longer, and in diameter from one-thirty-second to one-sixteenth inch.

The longitudinal folds of the abomasum, or true stomach, exhibit a congested appearance, and blood spots or effusions are not uncommon. In most cases earth will be found lodged in the folds of the stomach near its exit into the small bowel. This bowel shows little change of its mucous lining, except that in common with the remainder of the digestive tract there is a kind of white, slimy film covering it. An abnormal quantity of mucous is present, and in this one can discern on careful examination the wire worms. There is little change in other organs, apart from that due to anæmia.

Life History of the Stomach Worm.

The life history has been demonstrated by Ransom and Guberlet in America and Veglia in Africa, and since no work (to my knowledge) has been done here, one must accept their observations as applicable to Australia.

The male and female worms live in the fourth stomach or abomasum of sheep. According to Veglia, the life cycle is a direct one, the eggs passing through the intestines into the fæces, in which outside the body they soon become embryos. The worm passes through four larval stages, the eggs and the first two larval stages being non-parasitic and non-infective. The third larval form crawls on to a blade of grass, and with it is ingested by the sheep. On reaching the true stomach the larva casts its skin, emerges into the fourth stage, and bores into the mucous membrane of the stomach. The blood issuing from the injured place coagulates, and in the coagulum the

worm develops. Subsequently differentiation of sex, fertilisation, and egg-laying occur, the complete life cycle occupying from three weeks to one month.

On account of this abbreviated life history and the infectivity of our pastures at the College, we have found it necessary to treat all sheep on the farm once every twenty-eight days. By so doing the worms within the sheep are killed or expelled before extensive egg-laying occurs, and it is hoped all worms, larvæ, and eggs have been destroyed.

As regards longevity outside the animal body, Ransom (1908) kept larvæ alive in culture for nine months, Veglia (1915) ensheathed worms in water for more than five months, and Guberlet larval worms in cultures of soil and fæces for over eight months, and in one extreme case, two larvæ were living after sixteen months in the same culture. It is probable that the larvæ can, under natural and fairly moist conditions, remain infective and able to develop, if ingested, for about a year.

The seasonal distribution is not so marked here as in America and probably in Africa, owing to our mild winters, flock sheep not being housed at all. Verminous infestations and subsequent losses are very marked from July onwards, and following the heavy rains that usually break the droughts. The coastal belts are such fertile breeding areas for stomach worms that special care is required to maintain flocks there. At Hawkesbury Agricultural College several breeds have been tried, but the one at present kept, and which has during recent years resisted effectually the attacks of the stomach worms, is the Romney Marsh.

Drenches.

The sodium arsenite drench advocated by the Department for the tablelands was tested by Mr. Max Henry, and experimental work is described in the *Agricultural Gazette* in 1909 and 1913. The constituents are white arsenic 1 oz., sodium carbonate 2 oz., boiled in 1 quart of water; pour off the clear fluid, bury any sediment which may remain, and make up the liquid to 3 gallons with water. Dosage: Adults 2 oz., weaners 1½ oz., lambs 1 oz.

Owing to the fact that the above drench, though efficacious for the country mentioned, was unable to stay deaths in sheep (on the coastal plain) at the College, the following bluestone drench was tried for some time:—Bluestone powdered, 1 oz. dissolved in 1 gallon of water. Dosage: Adults 2 oz., weaners 1½ oz., lambs 1 oz. The administration of this was unsatisfactory, and did not free the College from anxiety as regards the flock, although in the stronger solution given below it has been found satisfactory in field practice generally.*

* For an account of bluestone drench advocated by the Stock Branch (not tested at Hawkesbury Agricultural College) see Diseases of Animals, Leaflet No 1—Powdered bluestone 4 oz., dissolved in 1 pint of hot water, using enamel or earthenware dish. When dissolved, add mustard 4 oz., and make up with cold water to 3 gallons. The solution contains 1 per cent. of bluestone. Dosage: Adult sheep 4 oz.; weaners 3 oz.; lambs 2 oz.

Two drenches advocated by the South African Department were tried, (*a*) a powder, and (*b*) a solution, both containing sodium arsenite and bluestone. The former was soon discarded as being unsuitable for our conditions, and the second gave variable results, though better than any of the other drenches tried. The drench at present used is the outcome of consultations with the College Chemist, Mr. Benjamin, and of experiments with the drench last named, and is composed as follows:—White arsenic 4 oz., powdered bluestone 16 oz., commercial muriatic acid 12 oz., water 1½ gallons. Directions: Add the acid to the white arsenic and dissolve by heat (glass or porcelain vessels are necessary). Dissolve the finely powdered bluestone in 1½ gallons of hot water in an enamel bucket. Then add the former to the latter, stirring the bluestone solution. Dosage: 6-tooth and over, 3 drachms; 4-tooth and over, 2½ drachms; 2-tooth and weaners, 1½ drachms; and lambs to 6 months, ½ to 1 drachm.

History of the Drenching Experiments at the College.

Until the beginning of 1920 the only drench used was that found efficacious for New England conditions—the alkaline sodium arsenite drench. During 1920 some experiments were carried out with a copper sulphate solution, but apparently it was too weak and the doses were too small to be satisfactory. In the same year experiments were commenced on new drenches advocated by the South African Department of Agriculture.

The results from none of the above drenches were satisfactory, partly owing to change of attendants, partly to drought conditions, and partly to the fact that the flock was only drenched every three months. During the year the problem was rendered more difficult by the agistment of 227 poor anæmic, worm-ridden crossbred sheep from two other farms. They arrived on 20th March and left the College on 28th June; the mortality was high despite treatment, and this was due no doubt to their emaciated and wormy condition on arrival, as well as to the unsatisfactory nature of the drenches and system of drenching.

During 1921 the drenching interval was reduced to six weeks, the drenches used being the soda-arsenic and also the arsenic-copper sulphate ("ascu") ones. At first the sheep made some improvement, but unfortunately during the latter half of the year the interval was not carefully observed and the result was seen in the increasing mortality towards the end of the year. During the first half of the year the experimental sheep were closely watched, and it was decided that the soda-arsenic drench would not hold the worms in check at six weeks intervals between drenchings. It should be noted that the drench was not tested for twenty-eight-day intervals. As the administration of the arsenic-copper sulphate drench was much quicker that drench was adopted, and more work is necessary before one can speak with certainty as to the efficacy of the soda arsenic drench for twenty-eight-day intervals. The copper sulphate-arsenic drench was given to half the flock during the first half of the year, and to the whole flock during the second half of the year, but for reasons stated above the drenching was not satisfactory.

In December, 1921, an experienced attendant was engaged, and a system of drenching was commenced, using only the "ascu" drench with 3-drachm doses for adults, and drenching was insisted on within every twenty-eight days.

As regards the experiments, it was noted during the latter half of 1920 that the apparent toxicity of the sodium arsenite-copper sulphate drench varied (perhaps due to varying quantities of arsenic in commercial samples of sodium arsenite or to debilitated sheep), resulting in efforts by the chemist and myself to produce a standard drench. The modified arsenic-bluestone is the one described above. With it experiments were at first tried on a small scale with a 3½-drachm dose for adult sheep. This proving too toxic, adult sheep were drenched with 2½-drachm doses, and since this dose gave apparently satisfactory results the drench was given to the flock in 1921, with this as the maximal dose, as described above. The deaths, within forty-eight hours of and following drenchings during that year were negligible, and it was very probable that in every case the debilitated state of the sheep was the predisposing cause.

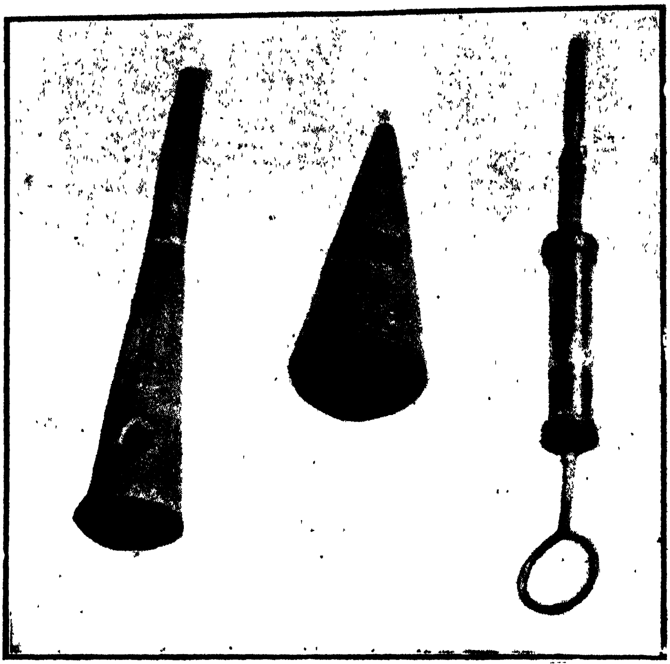
It became apparent that this drench was not staying the deaths at nominally six weeks drenching intervals (though actually the intervals varied up to three months, but this was not ascertained till afterwards), and further experiments were carried out on a small section of the flock with an adult dose of 3 drachms at twenty-eight-day intervals. The dose proved to be non-toxic for normal sheep, and to be very satisfactory as a vermicide.

Systematic drenching with this drench was commenced in February, 1922, and has been continued since. The mortality from worms quickly diminished, and soon apparently disappeared.

Sheep have been killed weekly for demonstration purposes, and this has afforded an excellent opportunity of following up the effects of the drenching. Apparently the stomach worm has disappeared from the flock. The College flock has not during the last eight years been troubled with tape worms or fluke; infestation with the "pimply gut" worm is occasionally noted, though it is much less marked now than formerly, which may or may not be due to the monthly drenchings.

At times deaths have occasionally been recorded within twenty-four hours of drenching, and practically in every case post mortem examination has revealed a "sanded" condition of the true stomach. It is thought the deaths have been due to absorption of arsenic, and to irritation of the mucous membrane already injured by the sand.

The improvement in type, constitution, and condition of the sheep since 1921 has been marked, and this has to a considerable degree been due to the Sheep and Wool Expert carrying out a system of feeding on fodder crops grown for the sheep, and the Sheep Instructor making use of every available piece of good grazing.



1 2 3

Drenching Tins and Syringe.

[See letterpress, page 57.]

Administering the Drench by Means of the Syringe.

Mode of Drenching.

For many years at the College the well-known common drenching tin (No. 2 in photograph) had been used. The manager of Borambola station has improved on this by adding a piece of piping (No. 1 in photograph).

When the dose of the "ascu" drench for adult sheep was reduced to 3 drachms, the tin was replaced by a cheap vulcanite syringe (No. 3 in photograph). Its glass cylinder was graduated in drachms and half drachms to 3 drachms by the use of a file. A copper rod with larger finger ring and leather plunger were substituted for the vulcanite rod and worsted plunger, and an enema nozzle was attached by a piece of short rubber tubing which permits the sheep to close on the nozzle without snapping it. A syringe similar to that illustrated can be bought for 2s. The syringe used now at the College has been the only one used, and it has been in continuous use since February, 1922, during which time over 30,000 sheep have been drenched.

The sheep is run down a race, caught by the left hand under the jaw, and almost before it has commenced to struggle the drench has been squirted through the mouth against the opposite cheek (see photograph). One swallow and the drench has gone. Not a single case of choking or of secondary pneumonia has been noted as a result of drenching. It is very unusual for the sheep to lose any of the drench or the operator to waste any. The dose for each type of sheep is readily and accurately measured by glancing at the graduations on the cylinder. The sheep is drenched standing, the advantages of which are obvious.

Owing to the fact that the sheep need not be handled roughly during drenching, it is the practice at the College to drench pregnant ewes right up to lambing (in some cases within a week of lambing) with no untoward results, and lambs are drenched from 6 weeks of age, though lambs 3 weeks of age have been drenched experimentally without showing any subsequent sickness therefrom.

The sheep are starved overnight, drenched next morning, and turned out in the afternoon. Sheep with lambs at foot are treated as above; the lambs are taken from the mothers about 7 a.m., and when the ewes have been drenched, usually by lunch time, the operator commences to drench the lambs. The ewes and lambs are turned out late in the afternoon, and no deleterious results have been noted from this procedure. Fresh, pure water is allowed, but salt licks should be removed from the paddocks for a couple of days following drenching.

The drench will hasten the death of badly-sanded and very weak sheep. Treatment in advanced cases is futile. In early cases treatment is effective, but prevention should be aimed at by all who claims to be progressive farmers.

Treatment should be commenced in any flock as soon as the first sheep sick of the disease is noticed. Periodical treatment should then be continued—if on the coast, indefinitely, if on the tablelands for twelve months, when, if the climatic conditions have been favourable, freedom from stomach worms can be hoped for until the next rains.

Drenching with the syringe can be done with much greater rapidity than with the drenching tin. At the College three sheep can be drenched where one was drenched before. What was a two days' job at the College is now a morning's work. In one case 100 two-tooth wethers were drenched in thirteen minutes; and 200 mixed ages Romney Marsh ewes were drenched in thirty-two minutes. The Sheep Instructor at the College, with no assistance whatever, drenched 450 mixed sheep in two and a half hours, including yarding; and assisted by two students he drenched 750 mixed sheep in two and a half hours under ordinary working conditions. Two men should be able to drench comfortably 2,000 sheep (using the syringe) in one day.

Other Mehtods of Preventing Stomach Worms in Sheep.

Do not over-stock, especially on succulent pastures (such as on alluvial flats) where worm larvæ are very likely to remain active in large numbers and for a longer time. Pastures carrying large numbers of sheep should, where practicable, be treated periodically with quicklime (½ ton to the acre), or burned off and spelled. Such paddocks can, if desired, be spelled by grazing horses on them.

Since the stomach worm can probably remain infective in the soil under natural conditions for twelve months, it is advisable, when spelling a pasture, to do so for at least that length of time. Fence off or reclaim boggy places, and where practicable dams should be replaced by troughs which should be cleaned periodically. Keep sheep in healthy condition by strict supervision and attention to their needs, *e.g.*, "foot-rotting" them at regular periods, crutching, &c.

Where practicable, feed off fodder crops to sheep. In wormy country it pays to keep sheep well away from the poverty line. Many a wormy sheep has owed its life to good feeding. Keep sheep supplied with a salt lick, and for ordinary conditions that advocated by the Stock Branch is suitable: Sulphate of iron, 1 part; sterilised bone meal, 5 parts; coarse salt, 30 parts.

Move sheep about from pasture to pasture, from low country to hilly country, from introduced grasses to native grasses, and vice versa. Very young lambs apparently are healthier and less liable to verminous infestation, on sweet, hilly country and native grasses. It is well to remember that young lambs, though in good condition and wool, may suffer heavy mortality from stomach worms.

How Worms Reinfest Pigs.

WORMS are extremely common in pigs in the coastal districts, because opportunity for pigs reinfesting themselves with the parasites is always present. Worms are taken in by the mouth and the eggs pass out with the dung, and when it is remembered how pigs delight in getting their feet into the trough, and often leave their droppings in it, it will be seen that the means of reinfestation are pretty handy. But the most prolific cause of mischief is a dirty wallow—an evil, filthy pool in the lower corner of the piggery, into which all the dung (and the eggs with it) is being continually washed.—W. L. HINDMARSH, District Veterinary Officer.

Farmers' Experiment Plots.

POTATO TRIALS, 1925–26.

Northern District.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

THE following farmers co-operated with the Department last season in the conduct of variety and fertiliser trials with potatoes :—

F. Wild, Dangarsleigh, via Armidale.
J. W. Jay, Ben Lomond.
J. Hill, Guyra.
W. Reddacliff, Tenterfield.
J. B. Howell, Red Range, via Glen Innes.
W. Lye, Loomberah, via Tamworth.
J. Monkley, Redbourneberry, via Singleton.

The tubers for planting were in most cases selected from the previous season's experiment plots and were of good quality. A single plot of each variety or fertiliser was sown as a rule. Each plot consisted of three or four rows 4 chains long and 30 to 36 inches apart, the tubers or sets being planted 4 inches deep, 18 to 22 inches apart.

RAINFALL during Fallow and Growing Periods.

Locality.	Fallow Period.	Growing Period.
	points.	points.
Ben Lomond	458	1,600
Guyra	1,503	1,760
Red Range	484	1,642
Tenterfield	350	1,911
Armidale	769	1,481
Singleton	673	553
Loomberah	......	963

In addition to the varieties mentioned in the table on the next page, other varieties tested at Guyra were Kerr's Pink (which yielded 1 ton 11 cwt. 3 qrs. table potatoes per acre, and 56 per cent. seed), and Gold Coin (1 ton 1 cwt. 1 qr. table potatoes per acre, 41 per cent. seed). Drought at Singleton and scald at Armidale reduced the yields considerably and largely spoilt the plots. At each place, with the exception of Red Range, a slow-maturing variety produced the highest yield. At Red Range (more subject to Irish blight than the other localities), Dakota Red, a slow maturing variety, yielded 1 ton less than Great Scott. As Dakota Red is not a heavy yielder the probability is that Surprise or Symington—both slow maturing and more prolific varieties—would have done better. On account of risk of Irish blight, only quick-maturing varieties are recommended for Red Range, and these should be sown early.

The varieties of greatest merit for New England conditions are—Satisfaction, Scott's Satisfaction or Northern Star (similar varieties), Factor, Great Scott, Surprise and Symington. Queen of the Valley is a good keeping and eating variety, but has numbers of deep-set eyes, and is not so shapely as the others. Surprise and Queen of the Valley are more subject to leaf roll and mosaic disease. Only once during the last six seasons, however, have these diseases reduced the yield at all appreciably; on this occasion they were responsible for a reduction of about 10 per cent.

No fertiliser was used in any of these variety trials.

RESULTS of Variety Trials.

Variety.	Loomberah.		Ben Lomond.		Guyra.		Tenterfield.		Red Range.	
	Yield of Table Potatoes.	Percentage Seed Potatoes.	Yield of Table Potatoes.	Percentage Seed Potatoes.	Yield of Table Potatoes.	Percentage Seed Potatoes.	Yield of Table Potatoes.	Percentage Seed Potatoes.	Yield of Table Potatoes.	Percentage Seed Potatoes.
	t. c. q.		t. c. q.		t. c. q.		t. c. q.		t. c. q.	
Surprise	*1 15 3	39	3 0 1	34	2 15 2	19	...	.	...	.
Factor	0 19 3	58	2 16 0	41	3 3 2	33	3 8 0	39	5 6 2	36
Teasdale ...	0 12 0	70	2 10 2	47	.			..	. .	...
Dakota Red ...	0 19 3	33		..	2 8 0	20	4 19 1	13	7 14 3	6
Queen of the Valley	0 12 3	55	..	.	.	.	5 5 0	27	.	. .
Satisfaction	0 13 3	69		..	2 8 0	27	3 3 1	15		.
Egan's Northern Star	...	.	3 13 2	23	3 1 2	30		.	8 1 3	10
Parson's Satisfaction	..		2 8 0	35	2 15 2	22	.	...	8 6 3	12
Scott's Satisfaction	...	..	3 13 2	23	2 12 0	25	...	.	7 18 1	10
Great Scott . .	.	..	3 0 1	33	2 9 0	40	...	..	*8 14 2	15
Batlow Beauty ...	...	..	3 0 0	30		. .	.	..	...	...
Early Manhattan	..	..	. .	.	3 2 2	20			8 13 2	12
Batlow Redsnooth	...	..	3 1 2	33	2 13 2	23	4 1 1	27	8 2 1	9
El Dorado	. .	. .	3 9 2	33		..	. .	...	..	..
Coronation	...	...	*4 2 1	28	.	.	4 17 1	41		.
Symington . . .	...	. .	3 9 2	28	*3 14 1	21	*5 15 0	10	.	...

* Tubers less than an inch in diameter were not weighed.

RESULTS of Fertiliser Trials.

Fertiliser per acre.	Ben Lomond.		Red Range.		Tenterfield.	
	Yield of table potatoes.	Percentage seed potatoes.	Yield of table potatoes.	Percentage seed potatoes.	Yield of table potatoes.	Percentage seed potatoes.
	t. c. q.		t. c. q.		t. c. q.	
P3,* 448 lb.	5 5 2	29	5 2 2	37	5 12 0	27
P3, 518 lb.	6 19 2	25	...	...	...	...
M3, 364 lb.	4 4 2	39	3 4 1	48	5 14 0	33
Special, 380 lb.	5 1 0	20	4 13 1	34	7 12 0	21
Unmanured	4 2 1	28	3 18 2	34	3 6 0	30
Superphosphate, 280 lb. ...	4 19 3	27	4 5 2	32	5 11 0	22
Blood and bone, 334 lb. ...	4 14 0	32	3 18 3†	38	7 12 0	21
M13, 364 lb	4 14 0	31	5 14 0	46	5 14 0	19

* P3 consists of 10 parts superphosphate, 3 parts sulphate of ammonia, and 3 parts sulphate of potash; M3 of 10 parts superphosphate and 3 parts sulphate of ammonia; M13 of 10 parts superphosphate and 3 parts sulphate of potash. Special mixture contains the equivalent in nitrogen and phosphorus of the blood and bone mixture, and is made up of 2·8 parts of superphosphate and 1 part sulphate of ammonia.

† The application of blood and bone at Red Range was actually 322 lb.

Except at Guyra, the results of the fertiliser trials indicate a benefit from sulphate of potash in combination with either superphosphate or superphosphate and sulphate of ammonia.

The special mixture plot showed increased yields over blood and bone, except at Tenterfield, where the yields were similar. These results indicate that the more soluble fertiliser is the better for returns in one season. The residual effect of blood and bone on a crop of wheat sown directly after the potatoes were harvested was superior to that of the other fertiliser, according to observations while the wheat was still in the early vegetative stage. M3, which contains 3½ parts superphosphate to 1 part of sulphate of ammonia, gave a smaller return than the special mixture. The dressing was 16 lb. per acre less, and the result may have been due to this or to the proportion of sulphate of ammonia.

RESULTS of Fertiliser Trial at Guyra.

Fertiliser per acre.	Yield of table potatoes.			Percentage seed potatoes.
	t	c.	q.	
P3, 511 lb.	1	11	3	36
M3, 422 lb.	2	8	3	34
Special, 444 lb.	2	9	0	35
Unmanured	2	8	0	27
Superphosphate, 333 lb. ...	2	0	1	32
Blood and bone, 400 lb. ..	2	2	2	30
M13, 422 lb.	2	10	1	28

The yield from October plantings at Guyra, Ben Lomond, and in other sections of the high New England tableland, is generally adversely affected when the January rainfall is deficient, as during the season under review. The fertilised sections had a greater vegetative growth and were more affected by the dry weather.

At Ben Lomond and Guyra where planting took place between 2nd and 5th October, the approximate times of maturity were as follows:—Gold Coin, the latter part of December; Great Scott and Parson's Satisfaction, end of January; Factor and Early Manhattan, mid-February; Scott's Satisfaction and Egan's Northern Star (same variety), end of February; Batlow Redsnooth and Queen of the Valley, mid-March; Coronation, end of March; Surprise, Symington, Dakota Red and Teasdale, the first week in April. At Red Range, where planting took place on 8th October, the order of maturing was the same, but maturity was reached a week earlier in the cases of the two first mentioned and a fortnight later in the cases of the others.

Two plantings of Great Scott and Satisfaction were made by Mr. J. Hill, at Guyra, this season—one in the experiment plot during the first week of October, and the other, in a similar position and soil, during the first week of January. The former planting required four months and the latter three months to mature. Notwithstanding that the sets held over to January

had shoots 2 feet long and were shrivelled and spongy, a better yield (approximately 6 tons per acre of table and seed potatoes) was obtained than from the earlier planting, and the grade was equally good. The usual practice is to make plantings of potatoes in the early spring, at a time when it has been found frosts are unlikely to occur. Mr. Hill's experience will doubtless result in a considerable extension of the planting season for the New England high tableland, say from the beginning of October to the end of December—a fine range.

At Tenterfield plantings a little earlier and later will be justified. For the Slopes and Hunter Valley early August is the general time for first plantings, and late February for the second crop. It is found advisable to obtain seed for the spring planting from a cool climate and to utilise the seed from the resultant early spring planting for sowing in February. In this latter section plantings cease about the end of September.

An experiment in the greening of seed prior to planting was made by Mr. Jay, at Ben Lomond, with Coronation. Portion of the seed was spread out in a well lighted shed (not in direct sunlight) and greened, and another portion was heaped up and covered from the light. A single plot trial resulted in an increase of 15 cwt. per acre in favour of the greened seed.

Details of the Plots.

Ben Lomond.—Slight slope to the west and south; red, friable, deep, well drained loam, of basaltic origin. The land was first broken from native pasture in 1920, and cropped with potatoes for four years. In 1924, two plantings of peas were made (in August and late December) on the same ground, both without fertiliser. The December sown crop was ploughed under in May, 1925, and the field was again ploughed 7 inches deep early in July, and harrowed twice late in September. The plots were planted on 5th and 6th October, and good quality tubers were harvested.

Loomberah.—Slightly sloping country; deep black self-mulching loam (a shallow alluvial deposit), the subsoil of good water holding capacity. Wheat was grown (without fertiliser) in 1923, a 15-bushel crop being harvested. Early in the autumn of 1925 a green crop (mainly of thistles and trefoil) was ploughed under. A 6-inch ploughing was given in October, and the land was cross-ploughed 4 to 5 inches deep in January, and similarly in May. Following the October, January and May ploughings, the land was harrowed, and again harrowed on 15th and 27th July, and 9th August. These cultivations were mainly for soil consolidation and moisture conservation, and produced satisfactory conditions in these regards. The potatoes, chiefly whole tubers, were planted on 13th August. There was good moisture content in the soil at planting, and the good sprouting and vigorous growth to flowering time promised good returns, but Rutherglen bug attacked the crop later in great numbers, persisting until harvest, and materially reducing the yield. The potatoes were harvested on 23rd January, and were firm and generally of good quality, free from scab and potato moth.

Guyra.—Upland location, red basaltic loam of good fertility. Oats sown in 1924 without fertiliser and harvested for hay. The cultivation for the experiment consisted of ploughing 7 inches deep in February and again in June and two harrowings in the spring. Planting took place on 2nd October, the potatoes being dropped in the furrow and covered by ploughing. No cultivation was performed immediately after planting, but three harrowings, one scuffling, and hilling were subsequently carried out, the last mentioned on 24th December. On 12th January, with the exception of Dakota Red, Surprise, Kerr's Pink and Symington, the plants had finished flowering. The potatoes harvested were of good quality, with only minor blemishes from disease.

Singleton.—Flat country, deep alluvial loam. Land occupied by lucerne for the five years previous to being cultivated for the experiment. The land was ploughed 7 inches deep in April, 1925 (at which time the soil was dry), twice harrowed on 23rd June, and ploughed 9 to 10 inches deep on 16th July. This ploughing was necessary to destroy stray lucerne plants. The field was twice harrowed directly after the ploughing.

The tubers were planted on 5th August. The first inter-row cultivation was given on 24th October, followed by another on 24th November, and a third during the first week in December. A very dry spring was experienced, and weeds were not troublesome. A good stand was obtained, and the crop promised well until the beginning of December. A shortage of rain from this time until time of harvesting in early January resulted in a non-profitable yield.

On the deep alluvial soils of the Hunter Valley, as far east as Singleton, it must be considered risky to grow potatoes without irrigation, especially in the spring.

Dangarsleigh.—Sloping position, basaltic black clay loam of self-mulching character. An unmanured crop of potatoes yielded 4 tons of "tables" per acre in 1923. In 1924 an unmanured wheat crop yielded 2 tons of hay per acre. The land was ploughed 6 inches deep early in March, 1925, in preparation for the experiment, and a second ploughing was given at the latter part of August, again to a depth of 6 inches. No other cultivation was given. The tubers were planted on 17th September. A good stand resulted and a high yielding crop was anticipated until 12th February, when between 4 and 6 a.m. a thunderstorm occurred registering 90 points of rain. A sunny day followed. A few days later it was noticed that the tubers were softened and shrivelling; later at least 50 per cent. rotted. It was surmised that scalding had occurred, as the rain only penetrated to about the depth of the tubers (within 4 inches of the surface), and the soil was dry below. The heat of the sun apparently raised the temperature of the moisture sufficiently to destroy life in the tubers, this rise of temperature being made possible by the dry layer of soil temporarily preventing diffusion between the subsoil moisture

and the surface soil moisture. This disastrous effect was very widespread throughout the Armidale section and caused a failure of the potato crop generally.

Tenterfield.—Located on country sloping gently to the north and west; deep sandy loam of granitic formation with good water holding subsoil. Land under pasture prior to 1924, when an unmanured crop of maize was grown after three ploughings, each about 9 inches deep. Ploughed 11th August, 5 to 6 inches deep, and harrowed 25th August. Planted on 25th and 26th August, at which time moisture was plentiful and no weeds were growing. Harrowing and inter-row cultivation and hilling were subsequently carried out and good quality tubers were harvested.

Red Range.—Undulating country, red to brown basaltic loam. Land under pasture prior to January, 1925, when turnips were sown broadcast; a poor crop resulted, owing mainly to the pasture having been broken up too late (December) to allow of moisture being stored. A 5-inch ploughing in August was followed immediately by harrowing, and on 26th September the land was springtooth-cultivated 4 inches deep. The plots were planted on 8th October, and subsequent harrowings and inter-row cultivations and hilling maintained the crop in a weed-free condition. Good quality potatoes were harvested from 1st February (when Great Scott and Parson's Satisfaction were mature) to 14th March, when the latest maturing variety (Dakota Red) was ready for digging.

Irish blight affected the tops from January, but not seriously enough to stop complete development of the tubers.

An experiment was carried out here with two lots of potatoes of the same variety, one lot of which had been grown at Red Range and the other comprising seed grown at Ben Lomond. Though planted on the same date, shoots from the Ben Lomond lot were above the surface fourteen days before the others. It is the practice of the grower of the Red Range lot to plant late, which may have affected the habit of the potato. Among the other likely factors are age and freedom or otherwise from disease.

Phylloxera Resistant Grape Vines from Government Nurseries.

Owing to vignerons failing to notify the Department as to their requirements in regard to grafted vines and rootlings, the Department is unable to confine the work of propagation to varieties which are in demand, with the result that the Department is involved in a loss which should be avoidable.

The prices charged are below the actual cost of production, and it is now imperative that vignerons should assist the Department by placing their orders early. It has, therefore, been decided that only sufficient grafts and rootlings will be propagated to meet orders lodged prior to 15th May in each year *for the following year's planting.* Growers should, therefore, communicate with the Department prior to that date if they desire to secure supplies from the Government nurseries.

Experiments with Peas at Kurrajong

J. DOUGLASS, H.D.A., Agricultural Instructor.

THE Kurrajong district is particularly suitable for the growing of garden peas, the favourable situation and climatic conditions enabling a large area to be used for winter pea production. This crop is harvested during July, August and September, and is normally placed on the market when supplies from other districts are light. Settlers who are waiting for orchards to come into bearing depend almost entirely on pea-growing as a source of income, and the crop has proved so profitable that even the majority of established orchardists have areas planted each year. The importance of this crop in the district cannot be realised until a visit is paid to the locality during the growing season. During the year 1924–25 the Government Statistician estimated that 1,272 acres of peas were grown in the North Richmond Police District.

In recent years the settlers have been experiencing considerable loss owing to a fungous disease, known locally as "pea sickness." This disease (commonly called "root rot") is widely spread over the district and causes greater loss locally than all other diseases combined. Under certain conditions losses as high as 80 per cent. have been experienced.

"Root rot" is caused by a parasitic fungus, which causes the rotting of the roots and base of the stem. In the early stages of development the rot is soft and water-sodden; later the structure shrivels, becomes darker in colour and breaks down, leaving only a few central fibres of the roots remaining. If the plants are badly infected in the early stages of growth, they usually shrivel and die. Fully grown plants may be affected in the same manner, although commonly they only weaken and the pods fail to fill. Diseased plants wilt very readily during hot, windy weather. The disease is first noticed in the field as occurring in patches. With continuous cropping with peas, these patches rapidly increase in area and join up with one another. The reproductive spores of root rot are carried over in the soil. Fallowing and crop rotation, avoiding leguminous crops, are the best methods of coping with the trouble. Unfortunately most Kurrajong growers find that a system of rotation is impracticable owing to the limited area of land suitable for winter peas and the difficulty in obtaining profitable rotation crops.

The economic importance of root rot in the Kurrajong district, and particularly on the Returned Soldiers' Settlement, was brought under the notice of this Department by the Department of Lands. Following inspection of portion of the district and interviews with several settlers, preliminary experiments were organised by the Biological and Field Branches of the Department in collaboration. Two soldier settlers, Messrs. Fenton and Hayes, co-operated with the Department in conducting these trials, a manurial

trial being conducted on each farm with the object of observing the results of certain manures on the growth and yield of the pea crop, and the influence (if any) on diseased plants.

Mr. Fenton has been troubled with the root rot on the major portion of his pea land for the last three years, and the manurial trial was purposely planted through one of the most infected portions of the farm. The soil is a light loam of volcanic origin, physically very open and deficient in organic matter. The area had been well prepared during the late summer and was in good condition at planting time. The plots were planted in duplicate with the object of reducing any experimental error caused by soil imperfection and fungous diseases. A fair germination was obtained throughout the plots, but very early in the growth of the crop root rot appeared in patches throughout the experiment, many of the plants being killed outright before flowering. At harvest time a very poor picking was obtained from some plots, while others were total failures. The plot treated with basic superphosphate produced the highest yield. Any difference in the growth and yield was due to the occurrence of the diseased patches rather than to any influence the fertiliser may have had. For this reason comparative yields were not taken.

The soil on Mr. Hayes' property is very similar to that on which Mr. Fenton's experiment was conducted. This area, however, has not shown signs of root rot up to date. Arrangements for the planting of this experiment were left in the hands of Mr. W. S. Arnold, Manager of the Soldiers' Settlement. Planting took place on 14th April, 1926, under ideal conditions, and germination and subsequent growth were excellent. No disease was noticed throughout the growing period.

The yields in the fertiliser trial on Mr. Hayes' property were as follows:—

Fertiliser.	Yield per acre. bus.	lb.
Superphosphate, 336 lb. per acre	208	6
Basic superphosphate, 384 lb. ,,	188	16
P1, 386 lb ,,	188	16
P10, 437 lb. ,,	188	16
P2, 386 lb. ,,	172	24
Blood and bone, 336 lb. ,,	172	24
P7, 301 lb. ,,	164	24
No manure	164	24
Gypsum, 336 lb. per acre	149	8

P1 consists of 10 parts superphosphate and 1½ parts sulphate of ammonia; P2 of 10 parts superphosphate and 1½ parts sulphate of potash; P7 of equal parts superphosphate and bonedust; and P10 of 10 parts superphosphate, 1½ parts sulphate of ammonia, and 1½ parts sulphate of potash.

The season was a very favourable one for pea growing, many heavy crops being pulled in the district. Good rains in the early stages of growth enabled the plants to become well established: the weather at picking time was favourable although rather dry. The yields obtained from the plots on Mr. Hayes' farm were very satisfactory. Superphosphate at 336 lb. per acre gave the best results, yielding 208 bushels 6 lb per acre. This yield is nearly 20 bushels per acre heavier than the next best, and shows superphosphate to be the most economical manure to use. Basic superphosphate

gave 188 bus. 16 lb. per acre and should be watched more closely in subsequent trials. It appears that P 7 and blood and bone are too slow in becoming available for the winter crop. The addition of sulphate of potash in P 2 and P 10 mixtures considerably lowered the yield. An application of gypsum at 336 lb. per acre showed a decrease on the unmanured plots.

The fact that the basic superphosphate gave good results in both manurial experiments may indicate that the addition of lime has a beneficial influence on the crop. Although no figures are available from Mr. Fenton's experiment, this manure promoted outstanding growth right throughout the growing period. It is usually found that basic superphosphate has a stimulating action on the germination of the seed. As a good germination is of vital importance in pea growing, the use of this fertiliser should be given greater consideration by local growers.

Mr. Fenton has several blocks very badly infested with root rot. Last autumn one block was dressed with lime with the object of checking the trouble. This grower claims that a heavier crop was produced this year than in any previous season. It is usually found. once the disease occurs, that with continual cropping with peas the yield gradually becomes smaller. The increased yield obtained in this case, however, may have been due to the favourable season. This experience, coupled with the results obtained from basic superphosphate, indicates that an experiment with liming would be justified.

A small experiment was conducted on Mr. Hayes' farm with the object of ascertaining :—

1. The best method of sowing seed and fertiliser.
2. The effect of doubling the rate of seeding.
3. Whether a heavier application than 2 cwt. of superphosphate per acre is beneficial.
4. The relative yield of local and imported seed.

It has been found that in a number of cases pea losses result from faulty germination caused by manure injury. The yields from the various plots were as follows :—

Details of planting.	Imported seed.		Local seed.	
	bus.	lb.	bus.	lb.
No manure; 1 bushel seed per acre	129	18	153	6
One bushel seed sown direct in drills, lightly covered with soil, and 2 cwt. superphosphate per acre distributed on top	192	14	161	12
Two cwt. superphosphate per acre direct in drills, covered, and seed sown on top	196	12	216	4
One bushel seed sown in direct contact with 2 cwt. superphosphate per acre	180	20	204	8
Three cwt. superphosphate per acre, not in contact with seed ...	...	...	172	24
Four cwt. superphosphate per acre, not in contact with seed ...	...	...	110	0
Two cwt. superphosphate per acre; seed sown at rate of 2 bus. per acre	145	10	...	...

It will be seen that spreading the manure in drills, covering lightly, and then sowing the seed—the method recommended by the Department—

gave the best results. The plot in which the seed was sown in direct contact with the fertiliser gave good results, but these were entirely due to the heavy rains at planting time: under normal conditions the seed would have been considerably damaged and a poor germination would have been obtained. Increasing the rate of superphosphate from 2 cwt. to 4 cwt. per acre decreased the yield. A reduction in yield was also experienced when the rate of seeding was increased to 2 bus. per acre. Taking the average of four plots, it was found that the local seed produced 183 bus. 22 lb. while the imported seed produced 174 bus. 23 lb. This latter test has been carried out in other districts and will be fully reported later.

The Keeping Qualities of Sweet Potatoes.

When the experiment recorded in the September issue of the *Agricultural Gazette* (page 691) was harvested on 9th to 11th June, the roots were bagged in the field, carted in, and spread out in thin layers on the floor of a well ventilated loft, where they remained undisturbed for four weeks. An examination was then made which revealed that only those roots damaged during harvesting operations were showing signs of decay. A month later a further examination was made, and it was found that the roots had a slightly shrivelled appearance, but only odd tubers among the following varieties showed decay:—Brooke's Gem, Pink Fiji, Red Carolina, and Georgia.

In September, three months after the roots had been dug, a further and final examination was made. Only a few sound roots of those varieties previously mentioned remained, while Madeira was also badly rotted. The varieties Yellow Strasburg, Nancy Hall, White Yam, Southern Queen, Brooke's Seedling, and Director were over 75 per cent. sound. It is noteworthy that with the exception of the last named these varieties are good market types as regards shape and size, and of good cooking quality.

In many instances it was only possible to detect unsound roots by careful examination, as on first appearance, apart from the shrivelled skin, the roots seemed sound, but when cut a dried flesh, brownish in colour, with an odour of fermentation, was revealed. In all cases the decay was a "dry rot." In addition there was a hardening of the skin, and when the roots were dropped a woody sound was emitted. Many of the sound, or apparently sound, roots became slightly blackened when cooked.

When planted in the seed beds, the roots germinated rapidly and well in the case of September planting; in the case of the earlier plantings in the middle of June, the germination was much slower, but the failures were very few. On the whole, the June planting was as satisfactory as the September planting. If it is possible to allow the roots to sprout before planting in the beds a much more rapid germination results, and the plants are much more vigorous.

It should be remembered that the past winter in this district was particularly favourable to the safe storage of sweet potatoes, being exceptionally dry, and also that the roots were removed from the soil before the occurrence of frosts.—R. N. Medley, Experimentalist, Wollongbar Experiment Farm.

Field Experiments with Peanuts.

GRAFTON EXPERIMENT FARM.

G. NICHOLSON, H.D.A., Experimentalist.

THE following experiments with peanuts were carried out at Grafton Experiment Farm during the season 1925–26:—

(1) Time of planting.
(2) Trial of White Spanish strains.
(3) Variety trial.
(4) Manurial trial.
(5) Spacing test.
(6) Stacking v. Cocking for curing.

Location.

The time of planting experiment, and the trial of White Spanish strains were situated on light sandy soil of somewhat poor texture and fertility, and at times poorly drained. In average seasons this soil is eminently suited for the production of clean bright shelled peanuts. The remaining experiments were situated on a fertile red volcanic loam which is of a loose open nature, dries out very rapidly after rain, and is probably the first area on the farm to show the effects of a dry spell. On this account, and also due to the fact that the soil clings to the shells and stains very readily, it is unsuitable. Since only short notice was given that it was intended to increase the acreage planted to peanuts, there was no other alternative but to make use of this area, as at that period no other land was available or in suitable condition for planting.

Soil Preparation, Rainfall, &c.

Experiments carried out on the sandy soil were planted in a well prepared seed bed suited to peanuts. The seed bed on the red volcanic loam was not in such good condition and was a little on the dry side at time of planting. Seasonal conditions were not entirely favourable. A torrential downfall early in November severely damaged the October planted experiments. Good conditions prevailed during the latter part of December and early January, with the result that the vines produced a luxuriant growth of foliage. A period of eight weeks of dry hot weather followed, severely checking the growth of the December-planted experiments. With a return to more favourable conditions during March the vines revived and commenced to peg freely. A week's continuous rain (265 points) in May, a few days previous to harvesting, caused a number of the shells to split badly and others to break away from the vines.

The rainfall was as follows:—September, 1925, 19 points; October, 129; November, 1,075; December, 272; January, 1926, 470; February, nil; March, 183; April, 282; May, 301; total, 2,731 points.

Prevalence of Disease.

October-planted experiments were, with one exception, practically free from disease. A number of the December-planted varieties suffered considerably from the effects of disease. A wilt caused by a fungus belonging to the *Sclerotinia* group was responsible for the greatest amount of damage. Locally grown seed was practically free from disease, while the introduced varieties all showed varying degrees of infection, two of them so much so that the entire crop of nuts was destroyed.

Harvesting.

The vines were removed from the ground with the aid of a mouldboard plough, the dirt was shaken from the roots, and three to four rows were thrown together to form a windrow. After wilting was complete, which took from one to two days, the vines were stacked around poles to cure. Curing was complete at the end of seven weeks.

Time of Planting Experiment.

Four plantings were to be made with the White Spanish variety, viz., one each in October, November, December, and January.

October Plot.—Planted on 9th. Rows were spaced 3 feet, and single kernels dropped about 6 inches apart in the furrows. This plot was damaged by heavy rain which fell in November, causing the soil to wash badly.

November Plot.—Planted on 5th. Heavy rain washed out the majority of the seed and damaged the plot beyond repair.

December Plot.—Not planted owing to land being out of condition.

January Plot.—Planted 16th. Growth poor compared with October plot.

RESULTS of Time of Planting Experiments.

Plot.	Date Harvested.	Yield per Acre.	
		Nuts.	Hay.
		lb.	lb.
October planting ...	19 Mar., 1926	800	2,027
January " ...	3 June, 1926	400	500

Yields of both plots were reduced, the former due to the thinning out of the stand owing to the soil washing, and the latter due to the destruction of the nuts by birds during the curing process. It was estimated that the January planting would yield in the vicinity of 700 lb. Late planting is not conducive to a large growth of foliage. One objection to late planting is that by the time the crop is fit to harvest the days are shorter, cool and moister weather conditions prevail, and heavy dews are frequent and occasional frosts; therefore on this account some difficulty may be experienced in curing the crop efficiently without loss or deterioration of the sample.

Although results, due to a number of factors, were not satisfactory this season, it is safe to assume for the time being that for early maturing varieties plantings may be made with safety until as late as January, but that later plantings will not be as prolific as October or November plantings.

Trial of White Spanish Strains.

The following strains of White Spanish were planted on sandy soil on 15th October:—

(1) Java.
(2) White Spanish (local strain No. 1).
(3) White Spanish (local strain No. 2).

Germination of the two local strains was good, but that of Java only fair. This trial was damaged by the November rains. The plots were harvested on 25th March.

TRIAL of White Spanish Strains.

Variety.	Acre Yields. Nuts.	Acre Yields. Hay.	Shelling percentage.
	lb.	cwt.	per cent.
White Spanish No. 2 ...	1,054	16·75	75
White Spanish No. 1 ...	1,022	21·00	75
Java	511	11·5	71·88

The three strains of White Spanish, although resembling each other in some respects, possess distinct characteristics by which they can easily be distinguished.

Java.—In habit of growth the vines are more compact, less vigorous, and the foliage denser that White Spanish No. 1. The pods and kernels are larger and the shelling percentage is a little lower.

White Spanish No. 1.—Produces an abundance of light green foliage and can easily be distinguished from Java.

White Spanish No. 2.—The top growth has a closer resemblance to that of Java than White Spanish No. 1, and the size of the pods is about midway between the two varieties.

Variety Trial.

The variety trial was planted on red volcanic soil on 1st December. The following were under trial:—

(1) Java	sown 5 to 6	inches apart,	36 lb. per acre.
(2) China	" 8 to 9	"	37 "
(3) Red Spanish ...	" 5 to 6	"	36 "
(4) Japanese	" 9 to 10	"	30 "
(5) Valencia	" 7 to 8	"	29 "
(6) White Spanish ...	" 5 to 6	"	24 "

The seed used, with the exception of White Spanish, was an excellent sample, being plump and of very uniform size, and apparently free from

disease. The local strain of White Spanish seed used, owing to scarcity of supply, contained a number of undersized kernels, hence the reason for the low rate of seeding.

China and Japanese were badly diseased; Red Spanish and Valencia to a less extent; Java slightly freer; White Spanish infection very light.

VARIETY Trial.

Variety.	Date Harvested.	Acre Yields. Nuts.	Acre Yields. Hay.
	1926	lb.	cwt.
White Spanish ...	25 June ...	1,317	23·75
Java	25 June ...	1,158	14·75
Red Spanish	25 May ...	800	22·25
Valencia	25 May ...	742	14·00
Japanese	15 June ...	Diseased ...	17·00
China	15 June ...	Diseased. Very few vines survived.	

Peanut Manurial Trial.

The above trial was carried out to test the value of using superphosphate and lime in combination and separately for increasing the yield per acre. The trial was planted on 1st December on red volcanic soil, and harvested on 25th May. The results were as follow:—

Treatment.	Nuts. Yield per acre.	Nuts. Increase.	Hay. Yield per acre.
	lb.	lb.	cwt.
No manure	1,244	......	15·5
2 cwt. lime and 1 cwt. superphosphate	1,621	377	17·57
1 cwt. superphosphate ...	1,373	129	15·5
2 cwt. lime	1,366	122	14·75

Spacing Test.

Planted on 2nd December on red volcanic soil. The variety used was White Spanish. Owing to shortage of seed, the kernels could not be graded, and the sample contained a number of undersized kernels. Had only graded kernels been used the rates of seeding shown below would have been considerably increased. Rows were in each instance spaced 3 feet apart, and single kernels sown at the distances indicated on next page.

The thicker seeded plots made profuse growth while conditions were favourable, but suffered heavily during the dry weather. With 3 inch spacing the vines were very crowded; the number and size of pods per plant were less than with the 6 inch spacing. The plots were harvested on 26th May.

SPACING Test.

Rate.	Nuts.	Hay per acre.
	lb.	cwt.
3 inch spacing (using 44 lb per acre) ...	1,717	24·75
6 inch spacing ,, 23 ,, ..	1,417	23·00
9 inch spacing ,, 15 ,, ..	1,266	21·25
12 inch spacing ,, 12 ,, ...	1,066	19·25

Stacking v. Cocking for Curing.

A small trial was carried out to test the most effective method for curing Six rows were harvested on 26th May, three of which were stacked on poles, and the remaining three placed in small stooks with the nuts exposed to the sun. The vines stacked around poles cured out well and gave a good sample of nuts. Those placed in stooks were damaged by rain, and birds, which are very troublesome at this farm, devoured every nut within ten days of harvesting. In localities where birds are not troublesome it would be possible, given fine weather, to partly cure the vines in the field for a few days and then cart them to an airy barn to complete the process. This method is only likely to prove successful when early planting is practised, for by the time later crops are fit to harvest heavy dews are frequent, the days are cooler, and difficulty will be experienced in getting the vines to dry out.

"THE CULTIVATION OF CITRUS FRUITS."

A copy of a very useful addition to the McMillan Company's "Rural Science Series" of books, edited by L. H. Bailey, entitled "The Cultivation of Citrus Fruits," by H. Harold Hume, reaches us from the publishers.

The book, which is of 560 pages, well printed and well illustrated, represents the experience and knowledge gained in more than a quarter of a century of intimate contact with orchard practice in relation to citrus fruits. The whole subject is covered, starting with the botany of citrus, followed by descriptions of each kind, with varieties of each. Propagation methods, suitable sites and soils, planting, cultivation, manuring, irrigation, and pruning details are given, while the concluding chapters discuss the picking, packing, and marketing of the crop, and the control of the pests and diseases which attack citrus.

Some Aspects of Apiculture in New South Wales.

W. A. GOODACRE, Senior Apiary Instructor.

A TOUR through the commercial apiaries in New South Wales gives a good deal of encouragement to anyone interested in the industry. We find progressive and enthusiastic men (and women, too) who are at all times keen on keeping their colonies and material in the best of condition, and on the lookout for improved methods and labour-saving devices. Their colonies may be examined with a minimum of labour to the apiarists and slight discomfort to the bees. The extracting room is bee-proof, allowing of no trouble from robbing and its trying consequences. The honey house, too, is so situated that it allows of the delivery of the honey from the hive, and the dispatch of the apiary products from the store with the minimum of trouble. The plant consists in quite a number of cases of a power extractor, cappings reducer, honey heater, steam-heated uncapping knives, honey pump, and sufficient tank accommodation, all of which are of modern type, capable of dealing with the extracting and processing of honey effectively and economically. The surplus honey is stored in a dry room in 60 lb. containers, and a liquefying vat, in some cases steam heated, is available for treating the honey just previous to marketing should it become granulated.

The Less Perfect Apiary.

If all worked their bees as does the good commercial apiarist what a satisfactory state of things it would be! In the course of inspection, unfortunately, we come across apiaries of quite a different sort—all of which, however, with the aid of a little encouragement and advice, might be reorganised by their owners on sound lines. At times we come across apiaries where, although up to fifty colonies are kept, the hive material is old and of the home-made type, and no readjustment work has been carried out for years, so that the bees may find egress through cracks in any of the supers, and every part of the hive is gummed together, almost requiring a crowbar for manipulation. Not that the well-constructed home-made hive is to be condemned, for many very good ones are made from sound benzine cases, but they must be given attention. The honey house of this apiarist is often not bee-proof and the plant has been neglected. There is practically no increase in the number of stocks from year to year, and although a large number of swarms are obtained, these just about make up for the winter losses. The departmental inspectors have quite a heavy task in such apiaries, for they know that if disease occurs and is allowed a free run, not only will this apiary be wiped out, but the careful neighbour's will suffer too.

It would seem at first sight to be hopeless to look for improvement in such a case, but it is not always so. Give the owner a demonstration by selecting a few old, spare hives, nail them up, seeing that the frames fit neatly with the correct spacing, and that the bottom board and cover are readjusted and sound. Now transfer No. 1 colony into these readjusted hive parts, cleaning the frames from the old hives as they are transferred to the new, removing some of the old drone combs and other useless ones, and substituting frames with full sheets of comb foundation—there are generally sufficient good combs occupied by the bees to prevent undue disturbance of the working force.

When he sees how simple is the process of manipulation, such an apiarist often finds his interest stimulated, and he will proceed with the readjustment of the whole apiary. Nor is it always necessary to start the work for him, an explanation as to how it is done and the good results that will obtain being often sufficient.

The correct size of the hive bodies, so that there is proper spacing all round the frames and between the sets of frames when the supers are in position, is of the greatest importance. It is also quite important that in every case factory-made frames of standard size be used. The man who makes his own frames in addition to the hive parts must indeed be a very competent carpenter if he is to operate with success.

The Beginner.

Much of interest is often found in the apiary of the beginner, for ample opportunity for education in the right methods of commencement in bee-keeping is nowadays available. The Department's apiaries at Wauchope and Hawkesbury Agricultural College are accessible to all who are interested; summer schools are held regularly at the latter institution, and informative literature is also available on application. Some of our prominent apiarists commenced operations seriously after having gained instruction from a departmental source—and not very long ago.

The beginner's hives are generally of factory manufacture, for this is advocated by the Department. Later on, when a full knowledge of the requirements of a hive is gained, the making of hive bodies, covers, and bottom boards may be carried on, probably with the aid of a saw bench and small motor. The plant is generally small for a beginning, comprising, say, a two-frame reversible extractor, two uncapping knives, a knife heater, a small combined cappings and wax press, a tank for processing the honey, and the requirements for working among the bees, such as a smoker, hive-tool, and bee veil.

In the case of the beginner who has not had the advantage of demonstration, but depends solely on literature, some difficulties in adjustment and manipulation arise at times. The Department is always pleased to help in these cases if the apiarist will describe his trouble. Recently a young man stated that he could not fasten the foundation securely on the flat top bars

of the frames with the roller. No doubt a point in the instruction had been missed. Before proceeding with the rolling work, after dipping the roller in water, he did not, perhaps, give the roller a shake to remove the surplus fluid, or he tried, perhaps, to fasten the foundation during cool weather, when the wax would be hard to bind into the wood, or he did not put sufficient pressure on the roller—that gradually increasing pressure which seemingly binds the comb foundation right into the wood. Until a little practice has been gained at fastening work, one can make sure of the job after using the roller by damping the handle of a pocket knife and pressing the edge of the wax fairly hard on to the frame with it. The metal ends of the handle, into which the blades are rivetted, are generally very convenient for this purpose. A short, round-pointed steel bar, say, three-eighths of an inch in thickness, kept fairly warm over a heater, is very convenient for making a secure job of the foundation fastening, the point of the bar being rubbed down the edge of the foundation.

Another beginner asks our opinion of the new type of Hoffman frame (Victorian pattern). We strongly recommend this frame. It is substantially made, and does away with the V edge business which has caused so much confusion in frame adjustment. Since the advent of this Victorian pattern we have been wondering why the idea was not adopted long ago.

Here is another interesting quotation from an observant young man: "I notice often in frames of brood during spring, and at times rather early in the season, the whole of the centre of the comb contains unsealed brood, and round the edges a fringe of solid sealed brood. Yet it is said that a good queen should have the sealed brood nicely packed?" In answer it was explained that this condition would nevertheless denote the work of a good queen. With the increasing population of the colony and the warmer weather, the brood rearing had been extended on the comb. A few weeks previously, no doubt, the brood had only consisted of the patch found unsealed.

KNOWLEDGE AND THE FARMER.

ONE reason why the farmer does not carry out the recommendations of the Department is sheer carelessness. I have found that you can point out to the farmer what he should do, you can explain to him exactly the methods to adopt to control certain diseases, but there is a big percentage of farmers who, as soon as your back is turned, will go and buy somebody's patent medicine.

The dairy-farmer is of the opinion that if he buys somebody's specific he has got a short cut to health, but there is no such short cut in cattle management. The only way you are going to keep cattle in good health is by careful personal attention in every detail. . . There are few farmers with the knowledge they ought to have, and a large proportion of those farmers who have the knowledge do not use it.—W. L. HINDMARSH, District Veterinary Officer.

Fumigation of Citrus Trees.

THE 1926 TRIALS WITH CALCIUM CYANIDE.

R. J. BENTON, H.D.A., Fruit Instructor.

Departmental experiments which were made in 1925 to determine the dosages necessary when using calcium cyanide "dust" indicated that a dosage much less than that recommended in the Allen No. 2 table would be satisfactorily effective. Experiments were therefore designed for the 1926 season (*a*) to confirm such indications if possible, (*b*) to test the results of distribution of the dust by hand as compared with distribution by the machine blower, and (*c*) to note whether any reduction in the length of time the tree is enclosed could be recommended.

The table overleaf indicates definitely that (*a*) the dosages for orange trees must not be less than the quantity recommended in the No. 2 table (substituting calcium cyanide for potassium cyanide); (*b*) distribution of the same amount of dust by hand is not as effective as distribution by the machine (see later remarks); and (*c*) any reduction below 45 minutes is not advisable when using the No. 2 dosage. These experiments were conducted on Late Valencia oranges in three districts—Dural, Wyong, and Kurrajong. The trees were infested with red scale, varying from a moderate to a heavy infestation.

The season was advanced, treatment commencing at Dural on 7th May, at Wyong on 27th May, and at Kurrajong on 28th June. Not less than forty-eight trees were fumigated in each district. The work was conducted almost entirely under the best of conditions, the weather being mostly bright and calm, with temperatures varying from 48 deg. Fah. to 69 deg., and humidity ranging from 42 per cent. to 82 per cent., while a few trees were treated when slightly damp with dew, the wet and dry bulb disclosing 93 per cent. humidity.

The percentage of scales dead two weeks after fumigation was calculated by Mr. Woodhill, Assistant Entomologist, who assisted in the experiments. Over 17,000 scales, representing approximately 500 scales obtained from each of the various treatments in each district, were examined. The tables on page 78 show the results obtained.

From these figures it is evident that, though 100 per cent. dosage for forty-five minutes gave a fairly satisfactory result, the kill varying from 98 per cent. to 98·9 per cent., in no case was it complete, and the inference from the "time-reduction test" (*c*) is that the kill would be greater if the tents remained at least five minutes longer over the trees. Probably increasing the dosage a little would effect the same purpose. A scale-kill ranging below 98 to 99 per cent. cannot be regarded as a satisfactory kill, though very much greater than is usually accomplished by spraying.

TABLE showing Results in Detail at Three Centres.

Dosage—Percentage of Allen No. 2 Table.	Method.	Wyong. 27th and 28th May.					Dural. 7th May.			Kurrajong, 28th and 29th June.				
		Average Temperature.	Average Humidity.	Scale Dead.		Total (dead).	Average Temperature.	Average Humidity.	Total average (dead).	Average Temperature.	Average Humidity.	Scale Dead.		Total (dead).
				On Leaves	On Fruit.							On Leaves	On Fruit.	
		Deg. F.	Per cent.	Per cent.	Per cent.	Per cent.	Deg. F.	Per cent	Per cent.	Deg. F.	Per cent.	Per cent.	Per cent.	Per cent.
	By blower—													
100	45 min.	61	63	97·4	98·5	98·0	65	53	98·9	54	61	97·6	99·2	98·3
80	45 ,, ...	62	61	85·9	92·4	88·6	65	53	91·1	54	61	94·2	77·6	87·8
60	45 ,, ...	62	61	89·2	90·8	89·9	66	48	75·3	52	73	89·7	83·0	86·3
40	45 ,, ...	61	66	80·0	85·0	82·2	68	47	75·0	52	73	77·5	63·3	71·4
	By hand—													
100	45 min.	60	71	91·1	95·0	93·2	69	47	94·8	50	72	87·6	82·0	85·4
80	45 ,, ...	62	87	89·1	77·2	83·5	68	45	86·7	56	63	94·5	63·2	79·0
60	45 ,, ...	64	62	59·8	70·8	64·3	68	47	81·0	56	63	95·8	43·5	72·6
40	45 ,, ...	64	53	39·7	32·4	37·0	68	51	70·6	56	63	60·5	43·0	52·6
	By Blower—													
100	35 min.	64	53	85·1	95·4	89·5	68	51	99·6	57	63	99·3	84·3	91·8
100	25 ,, ...	65	53	82·3	83·3	81·3	68	59	96·7	58	64	97·1	79·3	88·6
100	15 ,, ...	65	51	68·1	75·7	72·4	67	63	86·0	58	64	97·3	44·5	73·7
	Control trees	...	...	2·9	16·6	10·7	...	...	3·9	...	...	8·7	9·9	9·2
	Wetted fruit—100 per cent., 35 minutes.	..	...	...	95·6	...	...	...	...	Wet fruit, 150 per cent, 20 min.			95·1	...
	100 per cent. dose, 93 per cent. humidity.	...	...	99·3	100	99·8	...	...	...	....			...	...

NOTE.—100 per cent. dose means the full dosage recommended in Allen's No. 2 tables; 80 per cent. dose means eight-tenths of the same table, &c.

From this table the following information is obtained relative to the first, second, and third objectives of the experiment:—

TABLE showing average percentage of scale dead.

Strength—Allen No. 2 Table.	Dust applied by machine.	Dust applied by hand.
	Per cent.	Per cent.
100 per cent.	98·4	91·1
80 ,, ...	89·1	83·0
60 ,, ...	83·8	72·6
40 ,, ...	76·2	53·4

					Per cent.
Average scale dead after 100 per cent. dosage for 45 minutes					98·4
100	,,	,,	35	,, ...	93·6
100	,,	,,	25	,, ...	88·8
100	,,	,,	15	,, ...	77·3

Though, according to the table, the dust distribution by hand was not so effective as machine dusting, it is not considered that the hand method employed was a very good one. The dose was halved and placed in two large spoons. Two operators on each side of the tree then lifted the tent and simultaneously threw the dust as well as possible through the tree and dropped the tent. The dust frequently fell in masses up to one-eighth inch thick on fruit and branches, and defoliation was fairly heavy at each point whence the dust was thrown.

A "salt-shaker method" would appear to be preferable, using an increased dosage of 10 to 20 per cent. Owing to doubts expressed by some growers as to whether the gas generated would kill scale protected by a film of water (dew), a number of fruits were wetted before fumigation, and in every case a slightly greater kill on such wetted fruits was recorded. A much greater amount of "burning" is likely to occur, however, by fumigating when dew is present.

The damage caused to trees or fruit during these experiments was confined to a moderate amount of leaf fall, with two exceptions. One resulted in a very heavy leaf fall, and some fruit pitting and falling—worst on one tree—at Dural; and at Wyong (only on two trees out of four treated), where a very heavy leaf fall also occurred. The treatment in each case was 150 per cent. dosage for twenty minutes.

The trees at Wyong were partially defoliated before treatment, owing partly, at least, to much red scale, but the Dural trees were apparently in good condition. The latter trees were thriving on the very moist conditions ruling after the dry autumn. Apart from those instances, leaf-fall, varying from a light to a fairly heavy loss of foliage, was the only damage observed. Such loss of leaves would not be harmful; they fell from all parts of the tree, heavier at times near the mouth of the blower's nozzle. In all cases when used, the hose from the machine was kept moving, thus spraying the dust.

Fumigation for controlling all scale pests on citrus trees is now very widely recognised as being the most economical and effective method of treating such pests. Last season approximately 3,000 acres in this State were fumigated, calcium cyanide being chiefly used.

The majority of growers were highly pleased with the efficacy of this mode of gas generation, but a few growers were not satisfied with it. It is is not easy to account for such disappointment, which, as a result of either a poor scale-kill or of damage to the trees or fruit, makes these growers cautious in using the dust compound. Such cases are chiefly located in the Gosford district, and they mostly occurred after the breaking of the spring and summer drought. Conditions at such a time would not be so favourable for fumigation. The trees physically would not be normal, owing to the improved growing conditions, and the rate of the generation of the gas would be much increased, owing to the higher humidities of the atmosphere and the moisture contained in the soil.

Heavy dosages and high humidities (below the dew point) alone do not appear to be the factors to be guarded against if other conditions are satisfactory. Mr. W. B. Stokes in 1924 at Lisarow used dosages up to 266 per cent. of No. 2 table, with a humidity of 100 per cent., without incurring any serious damage. (This fact was confirmed to a certain extent recently.)

In the 1925 season's experiments, dosages ranging up to nearly 500 per cent. were used at a humidity of 66 per cent., also without material damage. These experiments were carried out in February and March, during which times the trees were in all probability in a normally hardened condition. The 1926 experiments, as already stated, were carried out in May and June last, but with the exception of three trees which were severely defoliated, no material damage resulted. The trees apparently were normal again five to six weeks after the drought had broken.

The chief damage usually occurred in the defoliation of that part of the tree which was in the continuous course of the blast from the blower. Unless the hose is moved slowly, thus spraying the dust, or provision is made to ensure a wide dispersal of the dust, defoliation in the track of the blast is likely.

The foregoing information applies only to citrus trees other than lemons. So far no extensive test with calcium cyanide has been conducted in the fumigation of lemon trees, as they were not conveniently situated to the experiments with orange trees.

The observations made of lemons fumigated show, almost without exception, that lemons cannot be " dusted " with a " machine blower " without causing very serious damage by burning and defoliation. Excellent results have been seen, however, when the dust—using even a 200 per cent. dosage—has been sprinkled on the ground beneath the tented tree.

It is believed that sufficient data has been obtained as to the efficiency of the dust form as a successful fumigant, and that it has been shown that it may be economically applied.

The other factor that really counts is—does it pay ?

At least two factors enter into the answer to this question—first, the actual cost of tents, chemical, labour, depreciation, &c., and, second, the difference in the return received from healthy trees and clean fruit each season, as against unhealthy trees and marked fruit. The latter factor is the most dependable indicator as to whether fumigation pays, and it really compels a grower of citrus fruits affected with scale pests to embrace fumigation as his best friend.

A difference in price of not less than 1s. to 4s. per bushel in favour of fruit from fumigated trees is very commonly received. Therefore, if a grower has a crop of 1,000 bushels, or even of 500 cases, he cannot afford to use any less efficient method in dealing with scale pests.

The Department is indebted to Messrs. P. and G. Best, of Dural, Mr. Ironmonger, of Gosford, and Messrs. Ewin and McKenzie, of Kurrajong, for the assistance they rendered, particularly in allowing the use of their fumigation sheets and machines, which rendered the carrying-out of these experiments a much easier matter than would otherwise have been the case.

Apiary Notes.

W. A. GOODACRE, Senior Apiary Instructor.

It is not very often that serious drought conditions occur in the coastal area, with its high average rainfall, but this season there has been a prolonged stretch of dry weather, and, to make matters worse, in many cases serious bush fires have destroyed much of the flora. It is anticipated that very little surplus honey will be produced on the coast this season, and this, combined with the off-season inland, will show a low average production over the State generally. The market, which has been in a glutted condition during the past few seasons, will no doubt be relieved this year.

Economy in the Hive during Drought.

There are interesting aspects of the economic conditions found in the hive during drought periods. As the adverse weather begins to have effect on the flora, and consequently the food supplies of the bees, the brood-rearing is gradually reduced to effect economy in the stored food. Further economy is effected by the worker bees destroying the drones. The whole working force will reserve its vitality by resting as much as possible and very little useless searching in the fields for supplies is evident. The colonies eventually arrive at the stage where a minimum amount of brood-rearing to keep up the population is carried on, the smallest quantity of stores being consumed, and as full as possible a reserve of vitality (which means lengthened life) is effected. Even where there is an ample store of food in the hive we generally find that economical conditions are noticeable, and these are intensified where there is a shortage of stores, in which case, if the apiarist does not attend to it, a complete cutting-out of brood-rearing may occur.

At Wauchope Government Apiary it has been necessary to keep a close watch on the colonies; in some cases we have found the bees practicing economy to too great an extent, and a little stimulating feed was given to induce sufficient brood-rearing to keep up the population. It is not a wise plan to overdo the stimulation, especially where pollen is on the scarce side. Our efforts were directed toward holding the colonies until a change in the weather and good rains should allow some improvement in the conditions. The bush fires around our apiaries, as in other parts of the country, have been very severe.

Light and Dark Honeys.

The honey which meets the most ready sale at the present time is light in colour—the nearer to water-white the more attractive it appears to the buyer. The very light honey, too, will win the championship at agricultural shows. The position is rather difficult to understand, unless the people have been educated to judge by their eyes. Many of our darker honeys have an excellent flavour, and are considered of higher food value.

One point, as mentioned by the French chemist, Alin Caillas, is of interest in this direction—"The presence of iron in honey is not illusionary. The most positive chemical analysis reveals it in variable proportions. From this viewpoint, the honeys most prized by the consumer are manifestly inferior; they usually contain but little iron, while the dark honeys of unattractive appearance contain much more iron."

Most of the darker honey is produced in this State during the autumn. It seems as though nature has provided for the bees in this direction, so that to withstand the hardships of winter they will have a food of superior chemical composition. It would mean a good deal to the industry if people could be induced to accept more of our darker honeys of good flavour, thereby to some extent accepting food value in preference to appearance.

Repairing the Bee Smoker.

The basil on the bellows of the bee smoker does not, in most cases, wear for any great length of time. The practice with the general apiarist when repairs are necessary is to replace with similar material, but this is not much of a success. We have tried using canvas at the Government Apiary—material similar to that which the best-grade horse rugs are made of, and the smokers repaired with this have been in use for years, no readjustment being necessary. The material has proved very successful in our tests.

The Honey Flora.

In keeping a record of the honey flora at Wauchope on the form issued a few months ago to a large number of apiarists in different parts of the State, we have an entry which reads: "Silky oak (*Grevillea robusta*) flowered from 18th October to 20th November, 1926. Although there was a drought in evidence, the bees worked very freely on the flowers of this tree practically the whole of the flowering period. That the trees secreted nectar freely was concluded not only from the number of bees which visited them, but it was observed that a large number of birds were on the flowers during the mornings, and that they were getting nectar, too. I would consider from my observation that this tree is a very good honey-producer, and of very much value during drought periods."

When a full record is made we will know how often this species flower. The tree thrives in the coastal areas.

We have received from the Director of the Botanic Gardens a plant of the Algaroba bean, a heavy honey-producer in the United States of America and in Honolulu. It is called the "mesquite bean" in America. The plant is thriving so far, and we are expecting some interesting observations later on. We tried the sugar gum (*E. corynocalyx*) for experiment purposes at Wauchope Apiary, but the climate was not favourable, and the trees developed disease and had to be destroyed.

We have tested the pepper tree (*Schinus molle*) at Wauchope Apiary, but it does not make anything like the headway that is to be found in most inland places, such as Dubbo, Tamworth, &c. There is a good deal in the effect climatic conditions have on the growth of certain timber.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Wheat—

Aussie	Manager, Wagga Experiment Farm, Bomen.
Bena	Manager, Experiment Farm, Temora. Manager, Experiment Farm, Cowra. Manager, Wagga Experiment Farm, Bomen. W. Ash, Old Grenfell Road, Forbes.
Binya	Manager, Experiment Farm, Condobolin.
Canberra	Manager, Experiment Farm, Condobolin. Manager, Experiment Farm, Cowra. Manager, Experiment Farm, Temora. Manager, Experiment Farm, Trangie. Manager, Wagga Experiment Farm, Bomen. W. G. Law, Wattle Park, Armatree.
Currawa	W. Cameron, Heather Brae, Loomberah.
Federation	Manager, Experiment Farm, Temora. Manager, Wagga Experiment Farm, Bomen. W. G. Law, Wattle Park, Armatree.
Firbank	Manager, Experiment Farm, Condobolin. Manager, Wagga Experiment Farm, Bomen. Manager, Experiment Farm, Trangie.
Ghurka	Manager, Experiment Farm, Condobolin.
Hard Federation	Manager, Experiment Farm, Temora. Manager, Experiment Farm, Cowra. Manager, Wagga Experiment Farm, Bomen. Manager, Experiment Farm, Trangie.
Major	Manager, Wagga Experiment Farm, Bomen.
Marshall's No. 3	Manager, Wagga Experiment Farm, Bomen. W. G. Law, Wattle Park, Armatree.
Riverina	W. G. Law, Wattle Park, Armatree.
Union	Manager, Wagga Experiment Farm, Bomen. Manager, Experiment Farm, Temora.
Wandilla	Manager, Experiment Farm, Temora. Manager, Experiment Farm, Cowra. Manager, Wagga Experiment Farm, Bomen. W. G. Law, Wattle Park, Armatree.
Waratah	Manager, Experiment Farm, Condobolin. Manager, Experiment Farm, Temora. Manager, Experiment Farm, Cowra. Manager, Wagga Experiment Farm, Bomen. Manager, Experiment Farm, Trangie.

Wheat—continued.

Yandilla King	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Cowra.
	Manager, Wagga Experiment Farm, Bomen.
	W. G. Law, Wattle Park, Armatree.
Zealand	Manager, Wagga Experiment Farm, Bomen.
Oats—	
Algerian	Manager, Experiment Farm, Bathurst.
Barley—	
Trabut	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Cowra.
Skinless	Manager, Wagga Experiment Farm, Bomen.
Pryor	Manager, Wagga Experiment Farm, Bomen.
Grasses—	
Sudan Grass	H. K. Nock, Nelungaloo.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1927.

Society and Secretary.		Date.
Gosford (E. H. Fountain) ..	Jan.	21, 22
Kiama (G. A. Somerville) ..	,,	25, 26
Wollongong (W. J. Cochrane) .	,,	27, 28, 29
Bellingen (F. Reynolds) . ..	Feb.	3, 4, 5
Berry (George Gillam) . ..	,,	4, 5
Leeton (W. Roseworn)	,,	8, 9
Tahmoor (E. S. Key) . ..	,,	11, 12
Wyong (H. Brown)	,,	11, 12
Tilba (R. L. Hopgood) . .	,,	11, 12
Guyra (A. A. Brown)	,,	15, 16
Newcastle (E J. Dann)	,,	15 to 19
Pambula (L. K. Longhurst) . ..	,,	16, 17
Milton (F. W. Cork)	,,	16, 17
Mullumbimby (A. W. Chew)	,,	16, 17
Rydal (H. Murray).. . .	,,	18, 19
Moruya (H. R. Jeffery)	,,	18, 19
Kangaroo Valley (L. W. Vance)	,,	18, 19
Castle Hill (H. A. Best)	,,	18, 19
Alstonville (N. A. Ogilvie) ..	,,	23, 24
Oberon (F. B. Packer)	,,	24, 25
Gunning (G. E. Ardill) .. .	,,	24, 25, 26
Cessnock (D. B. McGilvray) ..	,,	24, 25, 26
Robertson (H. T. Carrick) ..	,,	25, 26
Blacktown (J. McMurtrie) ..	,,	25, 26
Bega ( )	March	2, 3
Tumut ( )	,,	2, 3
Braidwood (R. L. Irwin) .. .	,,	2, 3
West Maitland (M. A. Brown) ..	,,	2 to 5
Adaminaby (P. L. Crisp)	,,	3, 4
Wauchope (T. Suters)	,,	3, 4
Mudgee (J. H. Shaw)	,,	3, 4, 5
Moss Vale (W. Holt)	,,	3, 4, 5
Penrith (C. H. Fulton)	,,	4, 5
Glen Innes (G. A. Priest).. ..	,,	8, 9, 10
Bangalow (W. H. Reading) ..	,,	9, 10
Taree (R. Plummer) .. .	,,	9, 10, 11
Luddenham (J. McKnight) ..	,,	11, 12
Granville (B. Hyslop)	,,	11, 12
Batlow (C. S. Gregory)	,,	15, 16
Cumnock (K. J. Abernethy) ..	,,	16
Nimbin (S. H. Kilmister).. ..	,,	16, 17
Eden (H. P. Wellings)	,,	16, 17
Gundagai (N. W. Holman) ..	March	16, 17
Mendooran (F. R. Mason) . ..	,,	18
Campbelltown (W. N. Rudd) ..	,,	18, 19
Blayney (J. H. Moore) .. .	,,	22, 23
Molong (W. P. Stanger)	,,	22, 23
Coraki (J. Allison)..	,,	23, 24
Kempsey (N. W Cameron) .	,,	23, 24, 25
Orange (G L. Williams)	,,	29, 30, 31
Camden (G. V. Sidman)	,,	31, Apl. 1, 2
Goulburn (F. D. Hay)	,,	31, Apl. 1, 2
Muswellbrook (R. C. Sawkins)	April	6, 7, 8
Sydney Royal (G. C. Somerville)	,,	11 to 20
Dorrigo (J. H. Skeoch) ..	,,	27, 28
Bathurst (N. B. Richardson) .	,,	27, 28, 29
Forster (W. Poppenhagen) ..	,,	29, 30
Grafton (L. C. Lawson)	May	4, 5, 6, 7
Windsor (H. S. Johnston) .	,,	5, 6, 7
Dungog (W. H. Green) . .	,,	11, 12, 13
Casino (P. W. W. Manson)	,,	25, 26, 27
Bonalbo (W. G. E. Johnston) ..	June	8, 9
Illabo..	Aug.	17
Wagga Wagga (F. H Croaker)..	,,	23, 24, 25
Cootamundra	,,	30, 31
Grenfell	,,	30, 31
Lake Cargelligo	,,	31
Young	Sept.	6, 7, 8
Ungarie	,,	7
Ganmain (C. C. Henderson) .	,,	13, 14
West Wyalong	,,	13, 14
Cowra	,,	13, 14
Albury (A. G. Young) .. .	,,	13, 14, 15
Murrumburrah	,,	20, 21
Canowindra..	,,	20, 21
Temora	,,	20, 21, 22
Boorowa	,,	22, 23
Barellan	,,	28
Barmedman..	,,	28
Hillston	,,	30
Ardlethan	Oct.	5
Quandialla	,,	5
Ariah Park	,,	12
Griffith	,,	18, 19

Poultry Notes.

JANUARY.

JAMES HADLINGTON, Poultry Expert.

As is usual at this time of the year, following the decline from the peak of egg production, scarcely a day goes by on which cases of abnormal death rates among flocks are not reported, and assistance sought in connection therewith.

It should be realised that the strain consequent upon the flush laying period is responsible for some of the cases, and a slightly increased death-rate is to be expected, especially among aged hens and where there is a low standard of stamina and physique in the flock. But these by no means represent the really serious troubles that are met with.

It is a lamentable fact that many poultry farmers live in almost constant fear that some dread disease is about to invade their farms, or has already done so. This fear is sometimes stimulated by statements emanating from sources that are not altogether uninterested in the sale of remedies. The fact is that poultry, both in the chicken and the adult stages, is much less subject to diseases that are calculated to wipe out flocks, or even seriously deplete them, than is generally supposed.

Health Depends on Management.

If poultry farmers would only realise that the health of their flocks is largely in their own hands and subject to good management, there would be very little to worry about on the score of disease. Poultry farmers fall easy victims to amateurish advice or unsound ideas in connection with the management of their farms, and now and again suggestions of this kind spread like waves through the poultry industry, leaving loss and worry in their train.

It is not long since poultry-farmers were being advised to feed large quantities of chaffed-up green feed in the morning mash. Some fed as high as 60 per cent., with the result that there was an alarming reduction in production, and also in the quality of the eggs.

Another craze that swept the industry was over-cooling and turning eggs during incubation, with many failures in hatching as the result.

"Feed more concentrates" was yet another idea of the kind. Not satisfied with using the proportions necessary to balance the ration, many farmers got it into their heads that by using larger quantities of concentrates, better results would be obtained. The effect of following this line was to ruin the "hatchability" of the eggs, to cause a high mortality among the birds, and to bring about a heavy falling-off in the rate of production. The best layers ate the most and suffered in proportion, and the farmer, not connecting up the facts, was mostly left speculating upon the cause of all his troubles. Usually he ended up by blaming "some organism" instead of his own folly.

An instance of one of the many mistakes in feeding came under notice quite lately. A number of laying hens in a big flock became ill, and some died. The general symptoms were that the birds' combs turned dark in colour, and there was marked loss of appetite, with an inevitable falling-off in egg production over the whole flock. A neighbouring farmer was consulted, and his verdict was that the trouble was influenza. The assistance of the Department was sought, and a visit was paid to the farm. Appearances led me to the conclusion that the trouble was of dietetic origin, but in order to clear up any possible doubt—not about influenza, but about any disease whatever—three of the worst cases were despatched to the Veterinary Research Station at Glenfield for examination. The hens in question were kept there and fed on ordinary food for some time, but no disease was detected.

In the meantime, investigation was made on the farm into the feeding and management of the birds.

I found that the proportion of common salt used in the mash was dissolved in a small quantity of hot water and then poured over the linseed meal the night before, to allow it to soak. This was incorporated in the whole of the mash next morning. The result of this procedure would be to make a brine composed of salt and linseed meal, and when this was distributed through the whole mash it would simply be particles of well-salted linseed. But for the fact that the mixing of the mash must have been exceptionally thorough, salt poisoning on a large scale would have resulted.

The above is only one of many cases of errors in feeding that come under notice, and that are responsible for the deaths and loss of production for which disease is blamed.

Experience shows that fully 90 per cent. of all the cases of the kind described are not due to specific diseases, but to errors in feeding in one way or another. In other words, they are dietetic troubles, and, as such, are avoidable by careful management.

The danger incurred by farmers using concentrates in any other way than by weight being realised, a table of measures corresponding to weights was worked out and published in these notes some few years ago. The table is now reprinted.

PASTE THIS UP IN THE FEED ROOM.

A kerosene tin filled with the following articles weighs approximately as under:—

	lb.		lb.
Pollard	18	Wheat (whole)	30
Bran	12	Maize (whole)	28
Lucerne meal	12	Maize (cracked)	25

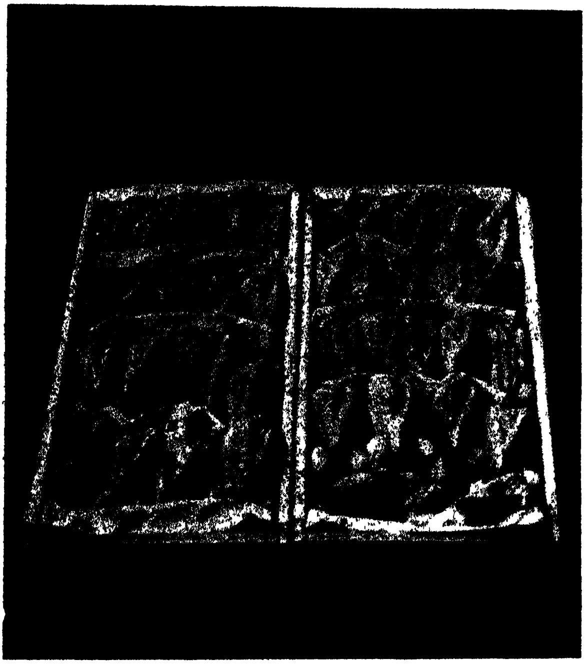
A quart measure filled, but not pressed down, will weigh approximately:—

	lb.	oz.		lb.	oz.
Wheat meal	1	8	Maize (whole)	1	12
Pollard	1	0	Peas (whole)	1	12
Bran	0	8	M.I.B. Meat meal	1	8
Lucerne meal	0	8	M.I.B. Compo meal	1	8
Oatmeal	1	0	M.I.B. Bone meal	1	12
Barley meal	1	8	Common salt (fine)	2	0
Maize meal	1	8	Flowers of sulphur	1	4
Linseed meal	1	0	Epsom salts	1	12
Wheat (whole)	2	0			

The only safe course where other measures are used is to ascertain the weight and mark same on the vessel used as a measure.

The one feature most responsible for errors in feeding is an almost general desire on the part of the farmer to depart from the beaten track in respect of the ration fed to the birds. A desire on the part of everyone to endeavour to increase egg production is well understood, but many of the expedients resorted to are worse than futile because they are mostly made with an imperfect knowledge of the factors involved.

For some years past the Department has been conducting feeding experiments, with a view to finding out whether improvement is possible in the ration fed at Hawkesbury Agricultural College and other Government farms.



Two Cases of Chickens packed for export to London, December, 1926.

and set out in the literature issued on the subject; but nothing in the way of improvement has, so far, come out of these experiments, and the only changes that have been made for some years past are in respect of the substitution of bran for lucerne, or *vice versa.* This change has been necessary mostly on account of the class of lucerne meal available. If the latter is of inferior quality, it is left out and bran substituted. On the ordinary poultry farm, where there is only the economic point of view to consider, both price and quality should be taken into account, because the feeding value of bran and good lucerne meal, or chaff, are much the same.

The ration fed and advocated by the Department, which has proved its worth in connection with the Egg-laying Competitions, appears in all the

literature on feeding issued by the Department, but a reminder might not be out of place. It consists of the following morning mash: Pollard, 60 lb.; bran, or bran and lucerne meal combined, 35 lb.; meat or Compo Meal (M.I.B.), 5 to 7 lb.; salt, 22 oz. It is most important that the salt be dissolved in the whole of the liquid used to mix the feed. The evening feed consists of wheat and cracked maize, two-thirds of the former to one-third of the latter, but the exact proportions are not material. A leaflet entitled "Rearing and Feeding" is available on application.

The Export of Spring Chickens.

It will be remembered that early in January, 1925, the Department made a trial shipment of 600 spring chickens to London, full details of which were published in "Poultry Notes" for February and June of that year. This initial consignment turned out fairly satisfactorily, and better things were looked for in future when the market should have been opened up.

Another shipment of 2,500 chickens was made in December, 1925. This time the birds were mostly drawn from poultry farmers who sent on their own account, the Department participating to the extent of a few hundred birds. This consignment was dressed and handled under entirely different conditions, and the results were not at all satisfactory. The reports from London indicated that appearances were the main trouble.

During his visit to London, the Minister, the Hon. W. F. Dunn, inquired fully into these matters, and he found that the prospects of making a market there for these spring chickens were good, providing the defects in the last consignment could be overcome. It was then decided to carry out experiments, with a view to eliminating the objectionable features. These tests have been carried out over a period of two months, and it is considered that a solution of the difficulties has been found. The Department has now made another consignment, comprising 500 birds. These were shipped by the "Moreton Bay," which left Sydney on 15th December last. A good deal of trouble has been gone to in order to attain the desired end, and the results of the third trial will be awaited with interest.

CONSOLIDATING THE SEED-BED

WHEAT requires a firmly consolidated seed-bed. In the Mallee and Wimmera the soil is loose and difficult to compact. It should be fallowed to a depth of 3½ to 4 inches—3 inches on new Mallee land—and subsequently worked over no deeper than 2½ inches, the object being to consolidate the soil between the loose mulch and the depth ploughed.

Methods of effecting this consolidation in these districts have been brought to a fine art in the Wimmera and on the best Mallee farms. The earlier the land is ploughed the more time it has to settle down. The more it is tilled shallowly to a carefully regulated depth, provided it is moist, the better the under-layers pack. The repeated tramping of the horses helps, and sheep do their part.—H. A. MULLETT, Superintendent of Agriculture, Victoria.

Orchard Notes.

JANUARY.

W. J. ALLEN and W. LE GAY BRERETON.

MOST of our inland and tableland fruit districts received copious rains right up to the end of the winter. Many of the coastal districts were not so fortunate and practically all the fruit districts have experienced a very dry time since spring. It is under such circumstances as a rule that the benefits of early ploughing and continuous cultivation show out strikingly. Even where loss of moisture by weeds and evaporation has been reduced as far as possible by cultivation, the store of soil moisture will be becoming depleted by now, so the land should still be kept in a condition capable of quickly absorbing any thunder showers that fall, and cultivation should follow suc. showers to conserve as much of the moisture as possible.

Green Manure Crops.

The season so far, even in districts that usually enjoy sufficient rainfall for an autumn cover crop for ploughing under, as well as for the trees, has been anything but favourable for such practice, and unless good soaking rains occur before these notes appear or by the early part of February it would be wiser not to attempt a green manure crop, but rather to give an early autumn ploughing, thus putting the land in the best condition to catch any rains that fall. This is a good practice to follow generally in districts where the usual rainfall is only just about sufficient for the trees, and where water is not available for irrigation.

Of course, where irrigation can be carried out, a green crop can be sown early next month, but it should still be remembered that a green crop is an extra drain on the soil moisture and is competing with the trees, so that a close watch should be kept on the moisture condition of the soil and subsoil, and water should be applied as necessary.

Soiling.

Generally speaking the citrus grower has finished marketing his fruit by January, and can then turn his attention to carting in fresh soil or any material that will rot down to increase the humus in the soil.

Harvesting.

In handling stone fruits for the fresh fruit market it is necessary to pick while the fruit is firm or it will reach the market in a mushy condition. The degree of maturity to which it can be allowed to attain depends largely on the distance between the orchard and the market.

Sometimes it is necessary to hasten picking in order to anticipate bad weather or to escape attack of birds or other pests, and quite often it is done to catch a good market, but whatever the motive extreme caution should be exercised. Immature fruit is not attractive. It is wonderful how the stone fruits especially fill up and improve in appearance if left on the trees a day or two longer. Immature fruit wilts very rapidly, and its appearance deteroriates during transport and while awaiting sale. A still more serious defect in immature fruit is that it is poor in flavour and unwholesome, and though a good price may be obtained for a single consignment, some consumers will be disappointed, and will perhaps lose faith in fresh fruit and henceforth will be shy buyers. A prejudice based on bitter experience is most difficult to overcome.

When picking in the heat of the day is unavoidable, every opportunity should be taken to allow the fruit to cool off before packing. The boxes containing the picked fruit should be kept in the shade of the tree while waiting to be carted to the packing shed, and, if not fully cooled off, they should be stacked in the shade at the shed in such a manner as to allow a free circulation of air. Fruit packed in a hot state cools off very slowly, and its keeping period is thereby much shortened. A leaflet on "Picking and Marketing" can be obtained free from the Department, also a Farmers' Bulletin on "The Packing of Fruit," at 10d., post free.

Drying.

Apricot drying will have been completed early this month, but some of the varieties of peaches suitable for drying will be ready towards the end of the month or early in February. To turn out a good dried article, the fruit must be of the right type and perfectly ripe. A bulletin dealing with the drying of fruit may be obtained from the Department at 10d., post free.

The Codling Moth.

Except in the cases of those varieties of apples and pears which are within two or three weeks of ripening, it will be necessary to continue the cover sprays of lead arsenate. Unfortunately there are many instances this season where sufficient fruit cannot be found on each tree to pay for the cost of spraying, and to leave these neglected is only to make increased moth trouble for next season. The most economical plan would seem to be to remove such few scattered fruits without delay and destroy them—that is, providing the crop is not forward enough to market as cookers. Even where the crop is light, it should pay to give the trees extra attention, as it is reasonable to expect excellent prices this season.

It is marvellous how soon the depredations from moth last season are forgotten by some, and how others are comforting themselves with the thought that it was an unusual outbreak, such as is bound to occur now and then. It is quite true that it was an unusual outbreak, and it is probably true of all insect pests that certain seasons are all in favour of their breeding in

great numbers rapidly. However, false comfort is very dangerous and it is wise to look squarely at the moth position. The codling moth has been destroying far too high a percentage of the crop for some years past in many districts, so that even allowing that last season was exceptional, there is still ample cause for anxiety.

Then, too, during that exceptionally bad year, orchards could be found in badly infested districts that were exceptionally free from moth—and not just exceptionally free compared with badly infested places that season, but orchards that could be considered exceptionally free for any season in the past four or five years. Moreover, everything indicated that that condition was due not only to the work put into moth control for that current season, but to previous seasons' work having reduced the moth to a minimum.

It is quite possible for certain conditions to occur at times that will cause unusual mortality among the moth, and thus to reduce it to reasonable limits again without any special human effort, but judging from past experience this does not seem probable—or, at any rate, such conditions may be long in coming and therefore human effort is essential.

It is claimed in some districts that codling moth can be controlled by spraying with lead arsenate alone. This may be true of particular districts, but it is certain that it is not true of all districts, and where it is not true every means must be employed to reduce the pest. This has also been the experience in other countries. It has been argued that methods other than spraying are too costly, but possibly when such statements have been made consideration has not been given to the extra returns due to saving fruit. Be that as it may, if the moth is not checked more successfully than it has been in the past few years many apple orchards will have to drop out or be carried on at a loss.

Some growers who have only very light crops (and here and there the fruit can hardly be termed a crop at all) will be inclined to neglect moth control on the ground that the return from the current season will not pay for it, but this is only piling up trouble for next season. Besides, an extremely light crop offers a very good opportunity for carrying out hand picking and destroying young fruit soon after the grubs have entered and before they have left the fruit. Such action carried out thoroughly will lessen the next season infestation appreciably.

It is possible that trapping on the wing may prove another useful auxilliary method of control, and it is being tried in the course of other important investigation work on codling moth at Bathurst by the Entomological branch. When that work is completed, there will, no doubt, be much more definite information about trapping the moth on the wing.

Though the data is at present too incomplete for the Department to definitely recommend trapping the moth on the wing as an auxilliary method of control, the results of some tests carried out last year and published in the South Australian *Journal of Agriculture*, Vol. XXX, No. 3, October, 1926,

p. 240 (also published in Bulletin 201) are sufficiently encouraging for growers to experiment with the method themselves. Moreover, it is evident from some of the recent American pomological periodicals that the method is causing interest there. In South Australia it was found that fermented apple juice diluted to 50 per cent. with water was superior to vinegar as a lure for the moth on the wing, though vinegar did act as a lure. Also, the lure placed in 2 lb. glass jars proved a superior trap to the same lure placed in cans. The jars were three-parts filled with the lure, and suspended toward the middle of the trees, the most shaded part being selected, as it was found the evaporation of the lure was not so rapid there. The jars require refilling every week. The catches were examined, and roughly 50 per cent. of the codling moths caught were females. The juice was obtained by allowing the fruit to decay in a suspended perforated bucket, and caught in a bucket set beneath it.

This could be tested by growers as soon as they have some reject apples this season, and then some rejects of late keeping apples could be kept to continue the test early the following season.

Woolly Aphis.

Where the parasite *Aphelinus mali* is not well established, it will be necessary to spray with tobacco wash or nicotine sulphate solution where woolly aphis is showing up. The hot dry weather has checked this pest in some localities this season.

Tests at Glen Innes Experiment Farm orchard have shown that three pints of miscible oil added to 100 gallons of either of the above sprays has increased their effectiveness. This amount of oil has so far not injured the fruit or foliage in the tests, but it is not safe to speak with certainty on this point until the tests have been carried out over a longer period, as the injury caused by an oil spray depends very much on the weather following the application. Leaflets on woolly aphis and tobacco wash are obtainable free from the Department.

Citrus Scale.

If the warm dry weather experienced in the early part of the summer continues, the white wax should not be bad, but where it is showing up it should be sprayed with washing soda (1½ lb. crystals to 4 gallons water) before the earliest of the young scale have reached the size of the head of a wax match.

Should red scale be present also, then resin soda spray should be used in place of the soda spray, or (better still) the trees should be fumigated. Fumigation can be delayed somewhat later than spraying. If the trees are showing distress through lack of moisture, it may be necessary to delay spraying and fumigation.

Leaflets on white wax, fumigation, and the mixing of resin soda can be obtained from the Department free.

Agricultural Gazette of New South Wales.

Championship Field Wheat Competitions.

THE JUDGES' REPORTS.

MIDDLE WEST WHEAT AREA.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

THIS year twelve agricultural societies in this division organised competitions providing for an area of crop of 50 acres, thus rendering the winners eligible to compete for championship honors; this is two more than the number that competed in any previous year. In addition two societies conducted competitions for crops of less area than 50 acres. This increase in the number of competitions is evidence of the progress that is being made in raising the standard of farming in the districts included in the division.

The following societies submitted entries for the championship :—Bogan Gate, Cumnock, Dubbo, Forbes, Gilgandra, Molong, Narromine, Parkes, Peak Hill, Trundle, Tullamore, and Wellington.

Owing to the wheat crops maturing much earlier this season than is usual, it was necessary to commence judging on 15th November (a week earlier than intended), and it was completed on 19th November.

The Season.

The season was favourable for wheat crops that were sown sufficiently early on well drained soils, but quite the reverse for those that were sown very late under unsatisfactory soil conditions. The total rainfall during the effective period, April to October, was ample, ranging from 10·55 inches at Trundle to 18·17 inches at Molong. The factors that were inimical to an all round prolific wheat season were excessive rains in March—up to 11·36 inches at Dubbo—the abundant rains during the seeding months, April and May, and the sparse rainfall (as low as 28 points at Narromine) during the critical month of October. The total registration at Dubbo for the three months, March, April, and May, was nearly 20 inches, or more than 14½ inches above the average for this period. This excessive precipitation considerably hampered seeding operations and much land that was of a heavy nature or in low-lying situations was either left unsown or was sown very late under unsatisfactory soil conditions.

Favourable spring weather is regarded as essential to the production of satisfactory yields by late-sown crops, but as good spring rains failed to materialise this season, payable returns could not be expected from most of the crops sown very late, demonstrating that the very late sowing of wheat is too much of a gamble.

The prospective yield of all crops in the competition, with the exception of one, was at least 33 bushels per acre, and the average yield of the whole of the crops was estimated at over 35 bushels per acre. This result is the highest yet attained in these competitions, and can be regarded as an indication that their educational influence is improving the farming methods in these districts.

The Leading Crops.

The prize-winners were :—

J. W. Eade, " Eade Vale," Euchareena (Molong Society)... ... 1

H. K. Nock, " Nelungaloo Homestead," Nelungaloo (Parkes Society) 2

J. L. Estens, " Glen Iris," Tooraweenah (Gilgandra Society) ... 3

The points awarded to each competitor and certain other details are set out in the table on page 97.

Molong signalled its debut in the competition by carrying off the championship with a well-headed, fairly dense and even crop of Waratah, estimated to yield an average of 12 bags per acre. Much credit is due to Mr. Eade for the production of a crop of such general high standard, the only defect of which was the presence of a little take-all and a trace of flag smut. The crop was grown on a chocolate loam of basaltic derivation, on which the previous crop was oats. It was fallowed 4 inches deep in July with a mouldboard plough, and ploughed again to a depth of 5 to 5½ inches with a disc plough in August. The fallow was cultivated with a springtooth cultivator in September, harrowed in October, springtoothed in November, springtoothed in January, springtoothed in February, skim-ploughed in March, springtoothed in April, and sown with the combine in the middle of May. Each time the land was springtoothed it was also harrowed by means of a light harrow which was attached to the cultivator. Counting this as one operation, the land received ten cultivations in all. The seed, which was graded, and treated with dry copper carbonate, was sown at the rate of 45 lb. per acre with 45 lb. high-grade superphosphate per acre.

It was no easy matter to decide that the crop of Mr. Nock was in any way inferior to that of the champion. It was a very dense crop of Bena, and was estimated to return 40 bushels per acre, the highest yield of all the crops in the competition. The crop was so heavy that it had lodged extensively in patches, and it was mainly this fact which reduced it to second place. The soil was a dark chocolate to red loam, which had been under cultivation for many years. For this crop the land had not been ploughed, the initial breaking of the fallow being performed with a disc cultivator to a depth of 2½ to 3 inches in July, and the ground springtoothed in September, harrowed in October, springtoothed end of November, springtoothed and harrowed in February and scarified before sowing in early May with the combine. Graded seed treated with dry copper carbonate was sown at the rate of 60 lb. per acre with 60 lb. high-grade superphosphate per acre.

For third prize the competition was very close; it was won by Mr. J. L. Estens by only half a point, with a crop of Turvey which was dense and well headed. In spite of the fact that it had been grazed by sheep in July, the crop was standing fully 5 feet high and had lodged in a few patches; its prospective yield was 13 bags per acre. It was the sixth crop grown on the land, which was fallowed 5 inches deep in July, disced in August, harrowed in September, springtoothed in October, disced in January and also in March, and sown with the combine during the first week in April at 45 lb. per acre with seed which had been treated with copper carbonate. No fertiliser was applied to this crop.

Special mention must be made of the Yandilla King crop on Mungeribar which by the narrowest margin failed to be placed. It could not be faulted as regards the presence of disease or of foreign varieties of wheat, but it was marred by the presence of saffron thistles. This weed is considered more undesirable in wheat crops than wild oats, for its seed cannot be so readily graded from the wheat grain.

Cultivation Methods.

The success of the prize-winners can largely be attributed to the intelligence and judgment shown in the cultivation of the fallows. In each instance the land was fallowed in July, the fallow was cultivated in early spring, and subsequent cultivations were carried out after rains to maintain a loose surface mulch. The total number of cultivations the land received was ten in the case of the champion crop, eight for the second crop, and seven for the crop placed third.

The quantity of seed sown by competitors ranged from 40 lb. to 68 lb. per acre, and the amount of superphosphate applied per acre from 40 lb. to 75 lb. high grade, which is equivalent to 97 lb. of the standard superphosphate. To three of the crops in the competition no fertiliser at all was applied. It may be a surprise to wheat growers in more southern districts that unmanured crops can run into third and fourth places in a championship competition, but the results of experiments indicate that applications of superphosphate to the soils in the northern portion of this division do not return such profitable increased yields as soils in the southern districts; the farther south the more the soil responds to fertiliser application. The reason for this is shown by soil analyses to be the higher phosphoric acid content of the soils in northern wheat districts than of those situated in the southern parts of the State.

Varieties.

Most of the standard varieties of wheat were represented in the competition with the exception of Canberra. The absence of this variety may be all the more surprising when it is considered that in the previous year's competition

in this division it filled the first four positions, but it can be attributed to the fact that Canberra, owing to its early maturity, is usually the last variety a farmer sows, and as already stated, the season was not favourable for late-sown crops. Waratah, the variety that is rivalling Canberra, has, however, put up a creditable performance as winner of the championship. During the few years that it has been in general cultivation, Waratah has proved itself a bag-filler under varying seasonal conditions. Mr. Eade grows each year small plots of numerous varieties of wheat, and this year has over one hundred, and of all the varieties he has tested he prefers to pin his faith to Waratah.

This is the first championship competition in which Bena has figured, and it signalled the occasion by carrying off the second prize, and promising the highest yield in the competition. The result of selection by Mr. J. T. Pridham, Plant Breeder of the Department of Agriculture, from a crop of Hard Federation, and considered to be a natural cross between this variety and Marshall's No. 3, Bena has returned remarkably high yields in experiments at Cowra Experiment Farm, but as it has only recently been introduced into general cultivation, it has yet to prove itself in wheat areas farther west. Turvey has consistently scored well in these competitions and Yandilla King is an old variety that always repays good treatment.

Diseases.

Eight of the twelve competitors used the dry copper carbonate method of seed treatment for bunt prevention, one used bluestone solution, one a proprietary wet pickle, and two neglected to treat the seed at all. Bunt was detected in three crops. One had received no seed treatment, one had been treated with a proprietary wet pickle, and the seed of the third had been treated with dry copper carbonate by means of a machine of unsatisfactory type which does not ensure that all grains are thoroughly coated with the powder. These results emphasise the necessity for the treatment of the seed and the superiority of the dry copper carbonate method for the prevention of bunt.

Flag smut was not so prevalent in the crops as in preceding years, and it is gratifying to note that farmers are making efforts to control this fungous disease chiefly by introducing an oat crop as a rotation in the farming system. These measures, however, cannot be regarded as wholly responsible for the lighter infection of the wheat crop this season, for the early autumn rains are considered to have been the chief controlling influence. Flag smut is usually most prevalent in crops sown early on dry seed-beds, and especially in crops grown on the lighter soils.

Infection of crops by take-all as well as flag smut would be prevented to a large extent by refraining from sowing on a dry seed-bed, and by the provision of a seed-bed that is firmly compacted.

DETAILS of Awards in Middle West Competition.

Society.	Competitor.	Variety.	When Sown.	Rate of Seeding per acre.	Superphosphate per acre.	Number of Crops grown previously.	Apparent Yield (one point for every bushel.)	Trueness to Type and Purity. Max., 20 points.	Freedom from Disease. Max., 30 points.	Evenness. Max., 20 points.	Condition. Max., 10 points.	Cleanliness.†	Total points.
				lb.	lb.								
Molong ...	J. W. Eade, "Eade Vale," Euchareena.	Waratah ...	Mid-May.	45	45*	Over 6	36	19½	28	19	9½	29	141
Parkes ...	H. K. Nock, Nelungaloo Homestead, Nelungaloo.	Bena ...	Early May	60	60*	Over 6	40	19	28	19	6	28	140
Gilgandra...	J. L. Estens, "Glen Iris," Tooraweenah.	Turvey ..	1st week April.	45	Nil.	5	39	18	28	19	8	27 (29)	139
Narromine.	Estate of the late Thos. Bragg, Mungeribar.	Yandilla King.	20 April	45	Nil.	Very old land	35	20	30	19	8½	26	138½
Wellington.	J. Sheridan, Glen Rowan, Drill Creek.	Yandilla King.	7 April	45	Nil.	Very old land.	35	19½	26	19	7½	29	136
Forbes ...	H. Green, "Kiaora," Forbes.	Waratah ...	2nd week April.	60	60*	Very old land	33	19½	28½	19	9	27	136
Dubbo ...	N. J. Harvey, "Kindalin," Dubbo.	Federation, 35 acres; Waratah, 15 acres.	End April and early May.	60	75*	7	35	19	28	19	9	24	134
Peak Hill...	J. Jelbart, "Penryn," Trewilga.	Turvey ...	17 April	50	50*	Very old land.	36	15	28	19½	8	26½	133
Trundle ..	K. Gault, "Lynwood," Trundle.	Waratah ...	Early May	50	45	Over 6	33	18	27	19½	9	24	130½
Bogan Gate.	J. M. Cronin and F. C. McCauley, "Werriwee," Bogan Gate.	Turvey ...	Last week April.	68	60*	9	36	15	26	19	8	26	130
Cumnock ...	W. B. Murray, "Glenwood," Eurimbla.	Marshall's No. 3	20 to 25 April.	60	45*	3	37	18	20	19	8	25 (27)	127
Tullamore..	J. Watts, Currajong Park, Kadungle.	Hard Federation, 35 acres; Quality, 15 acres.	20 April	40	40	None	27	14	28½	18	10	22½ (24)	120

* High grade.

† Maximum: First crop, 24 points; second crop, 25 points; third crop, 26 points; fourth crop, 27 points; fifth crop, 28 points; sixth crop, 29 points; over six crops, 30 points.

RIVERINA WHEAT AREA.

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

There were twelve societies entered for championship honors, viz., Yanco, Narrandera, Coolamon, Murrumbidgee (Wagga), The Rock (Farmers and Settlers' Association), Lockhart, Oaklands (Farmers and Settlers' Association), Berrigan, Finley, Corowa, Albury and Border, and Henty. Judging commenced at Yanco on 25th November, and was completed on 29th November, at Henty.

For some years past the Riverina district has enjoyed favourable seasons, which is reflected in the general air of prosperity and wellbeing of the farmers and towns. The wheat season, now nearing its end, is proving a very profitable one, and a general impression, after the completion of the judging

tour, is that the Riverina crops are from medium to good. While very heavy yielding crops are not numerous, the poor, thin crops are fewer than might be expected over such a wide area.

The rainfall during the fallowing period was generally satisfactory, and farmers were no doubt able to maintain the fallows in good condition up till the end of March. But towards the end of March, and during April, the rains, which at first were welcomed as aiding to make ideal seeding conditions, continued so long that cropping difficulties commenced, and proved great. Although the southern area of the State did not suffer from excess rainfall to the same extent as the central portions, yet the cold and dead condition of the soil towards the June and later sowings had a noticeable effect upon the germination, stooling, and growth of the southern crops. It is noted that the 14th of May was the latest that any crop entered in the championship competition was sown, indicating that soil warmth and quick germination are necessary to heavy yielding crops. Except for the wet conditions at sowing time, the factors necessary for good returns were favourable throughout the growing period. In view of the heavy early rains, the rainfall was ample and generally nicely distributed; damaging frosts did not occur.

The Winning Crops.

The prizes were awarded as follows:—

T. Sleeman, "Hermies," Jerilderie (Finley P. and A. Association)	1
W. J. McGrath, "Avon," The Rock (The Rock F. and S. Association) ...	2
E. and M. Kelly, "Hurstville," Urana (Lockhart A. and P. Society) ...	3

Mr. T. Sleeman won the championship with an excellent crop of Bomen, estimated to yield 35 bushels per acre. It was perhaps the most perfect competition crop that I have inspected, and was "right on top" in every section of the award. About half a dozen strangers in one width of the drill over a short distance (evidently a few grains had been left in the seed box upon changing over from another variety at sowing time) caused the only loss for type and purity. As this was only the fourth crop, it was handicapped 3 points for cleanliness.

Mr. Sleeman never treats Bomen seed to prevent disease, and he is evidently justified in his action on his farm as the crop was free from bunt. The crop was 4 feet high, even, well headed and filled, producing a bright plump sample of grain.

The land, which had previously produced three crops, the last being in 1924, was mouldboard-ploughed 3 inches deep in July-August, 1925, harrowed in September, spiked-rolled in October; during the summer sheep were grazed and the fallow was not worked; scarified in April, harrowed April, and sown with a combined drill on 28th April.

Mr. W. J. McGrath, whose crop was placed second, has evidently produced the heaviest yielding crop in the Riverina for the year. The crop of Waratah submitted, which had grown to a height of 5 feet, was particularly dense, well headed and filled, and promised to yield 45 bushels per acre. It had lodged badly in places, however, and lost 4 points for condition. An attempt was made to feed off the crop during the early growth, and thus minimise the danger of lodging, but frequent rains made this impossible. Being only the third crop it was handicapped 4 points for cleanliness, and 3 points were lost on the score of evenness, water-logged patches along one side of the block being the cause.

The land had grown wheat in 1924, and was mouldboard ploughed 4½ inches deep in August, 1925, harrowed September, springtooth cultivated October, disc cultivated April, 1926, springtooth cultivated end of April, springtoothed early May, sown on 9th May with a drill, and then harrowed. Graded copper carbonate treated seed at 73 lb. per acre and 112 lb. of high-grade superphosphate were used per acre. Sheep had the run of the fallow during the summer.

The third prize crop at Lockhart was a very uniform scoring crop of Waratah, and as it was the sixteenth crop on such land, special credit is due to the grower in keeping it so free of weeds and disease. A little foot-rot and traces of flag smut and loose smut were seen, but not in sufficient quantities to in any way affect the crop or succeeding crops. Estimated to yield 36 bushels per acre, it was 4 feet in height, well-headed, but in patches a little slack in the filling, and the density of the crop showed a gradual improvement from one end of the paddock to the other, where it would strip probably 14 bags per acre.

The last crop was wheat in 1924, and the land was mouldboard ploughed in August, 1925, harrowed in August and again in September, springtooth cultivated October, springtoothed February, 1926, and again in April and also May. Seed sown with a combine on 10th May, and land harrowed. Sheep were grazed on the fallows.

Some Comment.

Fallows.—It is evident that the increased return to be secured from frequently worked fallow is being more widely recognised, and each year such workings are tending to increase. Summarising all of the entries in this year's championship, and including the ploughing and the sowing as workings, the average number of times the fallow was worked was 6·1. Considering that sheep are available to keep weeds in check during the summer, the thoroughness with which fallows are now worked must be a source of satisfaction to the promoters of field competitions, as this was the main direction in which improvement was needed.

Rates of Seeding, &c.—The rates of seeding are increasing from year to year, the average this year being 73 lb. of graded seed per acre. Such

increase has been in conjunction with an increase in the amount of superphosphate used, which this year gives an average of 71 lb. of high grade per acre.

Seed Treatment.—The use of the dry copper carbonate treatment for the prevention of bunt has now superseded all other treatments throughout the State. A tribute to the efficacy of such treatment is that all treated seed in this competition was so treated, and only two bunt-infected plants were found in all the crops inspected.

Varieties.—The outstanding variety of this year is Waratah, it being the winner in five of the twelve competing centres. During the past three years it has proved itself throughout the State, and is undoubtedly one of the most useful wheats in cultivation. Turvey was twice exhibited, and judging by the number of such crops seen during the tour is a popular and useful sort, both for hay and grain.

The season was evidently not quite suited to Federation, as areas of this variety were rather flaggy, spongy, and noticeably affected by leaf-blight and some other diseases. Yandilla King matured rather quickly, and instead of a gradual ripening, the stems appeared to dry, resulting in somewhat defective grain.

Diseases.—It seems that with the dry copper carbonate treatment the problem of bunt control has been eliminated altogether. Throughout the wheat districts seed so treated has produced bunt-free crops.

In some centres of the Riverina, even in the championship crops, foot-rot and take-all are far too prevalent. Their occurrence can hardly be attributed to the season, but must be regarded as evidence of lack of control measures. The diseases can be controlled, and fairly easily, and those farmers interested may secure information in leaflet form from the Departme[nt of] Agriculture.

In two crops flag smut was fairly noticeable while traces appeared in most others, and two crops had an appreciable quantity of loose smut present; it would be advisable for the farmers concerned to secure a supply of seed from an uninfected source.

Impressions.

The outstanding impressions gleaned from the competition have been the benefits of—(1) frequent workings of the fallows; (2) heavy applications of seed; (3) heavy applications of superphosphate; (4) the use of copper carbonate; (5) the sowing of Waratah; and (6) early sowing. The first four may be accepted as axioms for the production of heavy crops, and have proved themselves during the past few years throughout the wheat areas. As regards the variety and time of sowing nothing so definite can be stated, but they are certainly worth considering. Early sowing of say, Waratah does not here mean mid-April sowing, as this would be merely asking for trouble, but it does advocate a sowing prior to the 20th of May.

DETAILS of Awards in Riverina Competition.

Local Society.	Name and Address of Competitor.	Variety.	When Sown.	Seed per acre.	Superphosphate per acre.	Number of Crops grown previously.	Apparent Yield (one point for every bus.)	Trueness to Type & Purity. Max., 20 pts.	Freedom from Disease. Max., 30 pts.	Evenness. Max., 20 points.	Condition. Max., 10 points.	Cleanliness. †	Total points.
				lb.	lb.								
Finley P. & A. Association.	T. Sleeman, "Hermies," Jerilderie.	Bomen ...	28 April	64	60*	3	35	19½	20	19	10	26½	139
The Rock F. & S. Association.	W. J. McGrath, "Avon," The Rock.	Waratah ...	9 May	73	112*	2	45	17	28	17	6	24	137
Lockhart A. & P. Society.	E. and M. Kelly, "Hurstville," Urana.	Waratah ...	10 May	60	50*	15	36	19	26	18	8	29	136
Murrumbidgee P. & A. Association.	J. McKewin, "Ewin Vale," Marrar.	Waratah ...	9 May	75	90*	19	38	19	26	18	9	25	135
Narrandera P. & A. Association.	M. J. Quitter, "Avondale," Narrandera	Waratah ..	13 May	75	80	8	36	16	28	19	7	27	133
Henty P. & A. Association.	T. E. Gorman, "Fairfield," Yerong Creek.	Turvey ...	14 May	80	78*	2	35	19	26	17	9	23	129
Oaklands F. & S Association.	C. M. Kerr, "Innisvale," Oaklands.	Federation	10 May	70	60*	2	37	19	22	18	9	24	129
Berrigan P. & A Society.	McDonald Bros., "Gena," Berrigan.	Yandilla King.	19 April	68	68*	14	31	19	21	18	6	28	123
Albury Border P. & A. Association.	J. Mathews, "Wandilla," Bulgandra.	Wandilla .	4 May	90	80*	1	36	15	23	17	7	23	121
Yanco Irrigation Area Agricultural Society.	Mayvon Bros., Farm 559, Leeton.	Waratah .	10 May	65	60*	2	29	19	23	16	9	24	120
Coolamon A. & P. Association.	W. Lawrence, "Redbank," Coolamon.	Turvey ..	28 April	90	90	21	29	17	20	16	8	29	119
Corowa P. A. & H. Association	F. R. Sammons, "Moorabinda," Corowa.	Yandilla King.	14 May	70	70*	10	30	19	26	10	8	17	110

* High grade.

† Maximum; first crop, 24 points; second crop, 25 points; third crop, 26 points; fourth crop, 27 points, fifth crop, 28 points; sixth crop, 29 points; over six crops, 30 points.

CENTRAL SOUTH-WEST AREA.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

The agricultural societies which conducted local competitions within this division were Ariah Park, Barellan, Barmedman, Boorowa, Canowindra, Cargelligo, Cootamundra, Cowra, Eugowra, Grenfell, Hillston, Illabo, Murrumburrah, Quandialla, Temora, West Wyalong, and Young. In addition competitions were conducted by the Tullibigeal and Ungarie branches of the Agricultural Bureau, and the winners of these were also allowed to compete for the championship. This made the fine total of nineteen competitors in this competition which, compared with the total number of seventeen crops entered and fifteen judged in the previous year, is indicative of the

increasing popularity of this form of agricultural education. Practically the whole of the wheat districts in this division were represented in the competition, and it is very gratifying to find included in the number the recently settled districts of Hillston, Cargelligo, Tullibigeal, and Ungarie, for there the information to be gathered from the competitions should be of the greatest importance.

There is considerable disparity in the time of the maturity of the crops in the western and eastern area of this division, and for judging purposes it was necessary to divide the area into two sections, the western section being judged from the 10th to 14th November and the eastern section from the 1st to 3rd December.

Ample rains for production of high yields were registered during the effective period—April to October—the total ranging from 9·66 inches at Hillston to 16·57 inches at Grenfell, but the rainfall was not very favourably distributed to ensure a generally successful harvest, for the season was characterised by autumn rains considerably above the average in nearly all districts and October rains much below the average. The excessive rains during the months March to May, totalling up to 14 inches at Cowra, completely saturated the soil and were responsible for much delay and difficulty in sowing the crops seasonably. Many farmers were unable to complete their sowing objectives, and a large number also were compelled to risk sowing their crops under boggy conditions with scant hope of success. The frequent rains during this period did not permit of the satisfactory destruction of weed growth, for the surface soil was rarely sufficiently dry to allow cultivation to do more than merely transplant the weeds; in consequence the crops sown under these conditions were at a great disadvantage by having to compete with a heavy growth of wild oats and cape weed. On account of the lack of spring rains, some of the crops "hayed off" prematurely, with the result that the grain was slightly pinched, though the bushel weight was quite satisfactory.

Details of the points awarded in the judging are set out in the table on page 105.

The prizes were awarded as follows:—

		Points.
1.	B. J. Stocks, "Linden Hills," Cunningar	139
2.	D. Robinson, "Mayfield," Canowindra	138
3.	Clark Bros., "Merryfields," Brobenah	137

The championship was won by a fine, well-headed crop of Marshall's No. 3, which was estimated to yield 36 bushels per acre. It was a very pure crop, comparatively free from weeds and disease, and in good harvesting condition; chiefly owing to the undulating nature of the land, the crop lost two points for evenness. The soil was a sandy loam of granitic origin which had previously produced seven crops; it was fallowed with the mouldboard plough 4 to 5 inches deep in July, harrowed in September, springtoothed in October, disced in

March for the purpose of destroying a growth of wild melons, and harrowed before sowing at the end of April with a combine to which light harrows were attached. The seed was treated with dry copper carbonate, and sown at the rate of 60 lb. per acre, with 60 lb. of high grade superphosphate per acre. In order to check rank growth the crop was grazed with sheep in July.

The second prize crop consisted of a block of Waratah, which was estimated to return the highest yield in the competition, namely 38 bushels. It was dense and well headed, but points were lost on the score of purity, for the presence of weed growth, and for slight infection by flag smut, loose smut, and rust. The land was fallowed with a disc plough in September, disced in January, springtoothed in March, and cross-springtoothed before sowing in the middle of May with 60 lb. per acre of seed treated with copper carbonate, and 50 lb. per acre of standard superphosphate. The early growth was trimmed by sheep during July.

The third prize went to the Barellan district for a good yielding crop of Yandilla King. In view of the fact that it was grown on land that had been cropped for very many years the crop was exceptionally free from weed growth. The purity of the crop was satisfactory, but take-all and flag smut were present in a small degree. The land was fallowed in June, scarified in August, and springtoothed in March and again in April. Seed treated with copper carbonate was sown in the middle of April at the rate of 60 lb. per acre, with an application of 60 lb. of high grade superphosphate per acre.

Much credit is due to Mr. Bolte for the judicious cultivation of the fallow which produced the fine crop of Turvey that ran a dead heat for fourth place. It was the best crop inspected in the competition and secured maximum points for freedom from weeds, but it was obliged to carry a penalty of four points on this score by reason of the fact that it was only the third crop that had been grown on the land. The rainfall at the farm was only 6¾ inches for the effective period April to October, which made the results of his efforts all the more praiseworthy. This crop was a very interesting object lesson of the value of a crop of oats in rotation with wheat, for a portion of the paddock upon which the preceding crop had been oats carried a much superior wheat crop to the remainder of the paddock on which the previous crop had been wheat. It is gratifying to observe that the cultivation of oats in rotation with the wheat crop is becoming more general, more particularly as an effective measure for controlling the ravages of flag smut and take-all, but in addition the demand on the plant food in the soil is lessened, for not only do the two crops require the elements of plant food in different proportions, but owing to their differing root systems they forage for plant food in different portions of the soil.

A review of the total points scored by the competing crops shows that there are only 6 points separating the first crop from that placed eleventh, which is an indication of the closeness of the competition.

The average of the estimated yields of all competing crops was over 33½ bushels, which exceeded the average in this division in any previous year, due largely to the improvement that has taken place in cultivation methods.

The competing crops were sown from mid-April to mid-May, the rates of seeding varied from 52 lb. to 80 lb. per acre, and the quantity of superphosphate applied ranged from 50 lb. to 142 lb. per acre in terms of the standard fertiliser.

Four crops, including the champion and the runner-up, were fed off by sheep during the winter. Under average conditions this is a practice that cannot be recommended for the production of the best yields, and it is preferable to sow varieties seasonably than to sow too early and feed off. This season, however, it was an advantage to graze off some crops, which had a tendency to over-luxuriance as the result of the very favourable autumn conditions. Unless checked in this manner a rank crop with unhardy tissues would have been produced which would be very susceptible to lodging, to adverse climatic conditions such as frosts, dry spells, and hot winds, and to infection by such diseases as rust, blight, and powdery mildew. In feeding off a wheat crop, judgment must be exercised if it is desired to avoid a severe reduction in yield; the crop should not be grazed too late in the season and should be fed down as quickly as possible by stocking heavily, and on no account should the crop be fed off if not free from weeds, for the weeds are almost sure to take possession.

The season has been favourable for the prolific growth of wild oats in the wheat crops in many districts, and a legacy will be left of infested cultivation paddocks, calling for persistent measures if fouling of succeeding wheat crops is to be avoided. It is unfortunate that the headlands of some paddocks carrying a luxuriant growth of wild oats were allowed to produce a heavy crop of seed destined to contaminate the paddock, whereas the infested crop could have been satisfactorily dealt with by converting it into silage by cutting it green and ploughing the headlands. The adoption of this course would have effectively controlled the wild oats, put the crop to good use, and provided an efficient fire break to the wheat crop.

For combating wild oats "an ounce of prevention is worth a ton of cure," but in the case of paddocks infested with wild oats the measures that will facilitate eradication may briefly be stated to be a good stubble burn followed by a cultivation in March, harrowing of the fallow immediately after ploughing in June or July, the use of sheep, and the cultivation of the fallow to prevent from seeding any oats growing on the fallow, awaiting a good rain to shoot any oat seed prior to the last shallow cultivation before sowing, and, lastly, increased quantities of seed and superphosphate.

Varieties.

By carrying off the championship, Marshall's No. 3 has demonstrated that it is by no means "a back number." It is more suitable to the eastern portions of this division, Yandilla King usually returning the higher yields in the western districts. It is considered that in districts suitable for Marshall's No. 3,

the new variety Bena, which has acquitted itself very well by running into fourth and sixth places in the competition, will also be very successful. It is a most promising variety with a very attractive ear and large grain. Owing to the size of its grain, a heavier rate of seeding is necessary than with the seed of most other varieties.

DETAILS of Awards in Central South-west Competition.

Local Society.	Name and Address of Competitor.	Variety.	When Sown.	Quantity of Seed per acre.	Quantity of Super-phosphate per acre.	No of Crops grown previously.	Apparent Yield (one point for every bus.)	Trueness to Type and Purity. Max. 20 pts	Freedom from Disease. Max. 30 points.	Evenness. Max. 20 points.	Condition. Max. 10 points.	Cleanliness †	Total Points.
				lb.	lb.								
Murrumburrah.	B. J. Stocks, "Linden Hills," Cunningar.	Marshall's No 3.	End April	60	60*	7	36	19½	28	18	9	28½	139
Canowindra	D. Robinson, "Mayfield," Canowindra.	Waratah ...	Mid-May	60	50	12	38	18	27	19	9	27	138
Barellan .	Clark Bros, "Merryfields," Brobenah.	Yandilla King.	Mid-April	60	60*	Very old land.	35	19	27	18	9	29	137
Cowra	J. Y. Freebairn, "Inglebrae," Wattamandara.	Bena ..	Mid-May	60	60	7	36	19	26	18	8	29	136
West Wyalong	D. Bolte, "Lincluden," West Wyalong	Turvey .	Mid April	80	100	2	36	19	27	19	9	26 (26)	136
Grenfell .	F. Adams, "Renown," Greenethorpe.	Bena ...	Mid-May	70	90	Very old land.	37	18	28	18	9	25	135
Barmedman	Maguire and Fehon, "Aorangi," Barmedman.	Waratah .	Mid-May	75	90	6	33	19	27	19	8	29	135
Temora .	J. Haggart, "Dundee," Warre Warral.	Waratah .	1st week May.	60	60*	3	34	18	27½	19	10	25½ (27)	134
Young .	H. C. Thackeray, "Makari," Young.	Yandilla King, 30 acres, Bena, 20 acres.	2nd week May	60	56	13	35	18½	27½	19	9	25	134
Illabo ..	S. J. Kanaley, "Hazeldene," Junee.	Late Gluyas.	Last week May.	85	110*	Old land.	34	18½	25	19	9	28½	134
Hillston ..	R. and A. J. Peters, "Bonnie Doon," Hillston	Waratah .	1st week May.	60	60*	Over 6.	31	18	26	19½	9½	29	133
Tullibigeal Agricultural Bureau.	H. Hamling, "Rosedale," Tullibigeal.	Turvey ..	Mid-April	55	50*	5	33	17	27	19	7	28½ (29)	131½
Boorowa .	R. I. Clark, "Armidale," Boorowa.	Marshall's No. 3.	Mid-April.	60	56*	Very old land.	34	19½	24	17	8½	28	131
Cootamundra.	L. B. Boxsell, "Cherry Grove," Wallendbeen.	Waratah ...	Mid-May	75	75	Very old land.	34	17	28	19	9	24	131
Ariah Park	M. McCrone, "Bimgambil," Mirrool.	Waratah ...	6th to 15th May.	70	60	12	28	18	27	17	10	29	129
Quandialla	G. Troy, "Fairfield," Quandialla.	Turvey ...	Mid-May	52	75*	New land.	35	15	28	19	9	23 (24)	129
Cargelligo	E. E. Booth, "Mountain View," Cargelligo.	Waratah ...	Mid-April.	70	70*	2	31	15	26	19	9	25½ (26)	125½
Eugowra	W. Townsend, "Glenavy," Eugowra.	Waratah ...	Mid-May	65	65*	Very old land.	30	17	26	19	9	22	123
Ungarie Agricultural Bureau.	G. D. Russell, "Alawa," Ungarie.	Turvey ...	Mid-May	60	45*	4	29	15	15	19	9	25 (28)	112

*** High-grade.**

†Maximum: first crop, 24 points; second crop, 25 points; third crop, 26 points; fourth crop, 27 points; fifth crop, 28 points; sixth crop, 29 points; over six crops, 30 points.

It is interesting to note how Waratah distinguished itself in this competition. It was the most successful in the local competitions, providing eight winners out of the nineteen which were eligible for championship honours; it was the variety which secured the second prize and was estimated to return the highest yield in the competition. The increasing popularity of Waratah is remarkable; it is a comparatively new variety, and yet, according to statistics collected last year of the areas and returns of the different varieties in cultivation in the State, it was the sixth most largely grown variety and its average yield was the highest of all the extensively-grown varieties. It is estimated that the area under Waratah this season was double that of the previous year, and as it has proved a high yielder in all parts of the wheat areas it appears safe to predict that in a few years it will oust Federation from its premier position as the most largely grown variety in the State. For an early variety it stands up well and is hardy, but unfortunately, like most of our varieties, it is susceptible to infection by flag smut.

Turvey is another variety which has risen in popular estimation in recent years. It is a dual purpose wheat of high merit, very suited to the conditions, in this division.

Diseases.

While many of the crops inspected were infected with flag smut and take-all, these diseases were not nearly so prominent as has generally been the case in recent years. The early autumn rains supplied seed-bed conditions which were not very conducive to the attack of these fungus pests, but, on the other hand, these early rains are regarded as being very favourable for the infection of crops by bunt. Fortunately the dry copper carbonate method of treatment of seed wheat is proving an efficient weapon of defence against this last-mentioned fungus, as demonstrated by the results in this competition. Of the nineteen crops judged, no less than sixteen were treated with copper carbonate powder, and of these only one was infected with bunt and in that case the seed had been treated by means of a machine of the gravity type which has not proved effective in coating the grain with the powder. In comparison with this record the only crop for which the seed had been treated with bluestone solution was badly bunted, and of two crops resulting from formalin-treated seed one was infected with bunt. These results may be regarded as eloquent testimony of the superiority of the dry copper carbonate method over the wet treatments, and they also serve to indicate that had it not been for the extensive adoption of the copper carbonate treatment the grain from this season's harvest would have been considerably reduced in value as the result of bunt infection. Even the most careful farmers found it difficult to keep their crops absolutely free from bunt by means of the wet methods formerly practised; there was usually a trace of the disease present in their crops, and it only required the slightest error in treatment, coupled with favourable seasonal conditions, to cause a severe infection. From results

to date it appears evident that with the universal adoption of the practice of treating seed wheat with dry copper carbonate by means of satisfactory dusting machines, the complete control of bunt can assuredly be predicted. In allotting points for freedom from disease a crop is more severely penalised. because of the presence of bunt than for infection by less easily controlled diseases, and because the grain is not satisfactory for seed purposes and its commercial value is also considerably reduced. A couple of crops were infected with wheat blight (*Septoria tritici*). This disease has made its appearance in a few wheat crops in recent years and was fairly prevalent this season. Cold, wet conditions are favourable for its development, and in severe attacks it results in a weakened straw that breaks down and lodges, and in a discoloured ear that produces pinched grain. Some varieties are much more susceptible than others to this disease, and in cases of severe attack it is advisable to avoid a recurrence by changing the variety. Other preventive measures are a good stubble burn and lighter sowings on well fallowed land.

NORTH-WESTERN WHEAT AREA.

G. C. SPARKS, H.D.A., Manager, Glen Innes Experiment Farm.

Upon this occasion seven societies qualified for championship honours viz.:—Inverell, Moree, Narrabri, Boggabri, Wee Waa, Gunnedah, and Tamworth. Due to very rapid ripening, however, the Boggabri crop was withdrawn, and only six inspections were made. The result was as follows :—

J. Cavanagh, " Springhurst," Curlewis, Gunnedah district, 135½ points.
Cosh Bros., " Karoola," Pallamallawa, Moree district, 133½ points.
R. J. McWilliam, " Matoppo," Turrawan, Narrabri district, 131 points.

It is to be regretted that other important centres, such as Manilla and Quirindi, failed to carry out district competitions, and thus enable the championship to be more truly representative of the territory.

The Curlewis crop was on black light loam, now cropped for the fourth time in four years. The land was ploughed in December, 1925, springtoothed in January, 1926, and again in the month following, the fallow being heavily stocked with sheep. The crop was sown by combine on 12th to 15th May, 1926, with 38 lb. per acre of graded seed, unmanured. This crop gave the highest apparent yield of the series, viz., 34 bushels per acre, was of excellent type, and very pure. It showed a trace of flag smut and foot-rot, but was very healthy and well grown. It was weed-free, except for a very little prickly lettuce, the ubiquitous black oat being absent. Mr. Cavanagh was runner-up in the 1925 Championship, and is to be congratulated upon his success upon this occasion.

The Pallamallawa crop was on chocolate light loam that had previously been cropped to wheat ten times in eleven years, but long fallowed in preparation for the crop under review. The land was disced in March and July,

1925, and then received four workings, evenly spread over the following ten months, with the combine, being immediately afterwards harrowed in each case. Seeding was done also with the combine during the last week of May with 60 lb. per acre of graded seed, portion of the paddock being manured with 45 lb. of superphosphate per acre. This crop was produced on the lowest effective rainfall of the series, viz., 433 points, and upon this the apparent yield of ten and a half bags per acre is highly satisfactory; it was rendered possible by the conservation of all available moisture by the long fallow abovementioned. The crop was also very satisfactory as regards type and purity, and lost only half a point to the winning crop for freedom from disease, showing a little flag smut and a trace of loose smut. It was slightly lodged in patches, and carried a light sprinkling of black oats.

The Turrawan crop was on red loam now cropped for the eleventh time in fifteen years, the 1926 crop being on long fallow. The cultural details were:—Ploughed July, 1925; harrowed September, springtoothed December, springtoothed March, 1926; sown by combine April and May with 60 lb. of graded seed, unmanured. The fallow was heavily stocked, but the crop was not fed off. Heavy autumn rain somewhat discounted the value of the long fallow. The crop gave an apparent yield of 29 bushels per acre, equalled the two foregoing as regards type and purity, and was equally as disease-free as the winning crop, showing only a trace of flag smut. It carried some black oats, however, and odd thistles.

The Season.

With the exception of the country lying to the north and west of Narrabri, where almost drought conditions obtained, the north-west wheat belt was blessed with a good season in 1926. The fallow rains were copious, particularly over the summer and autumn of 1925-26, which is a further indication of the fact that in ordinary years short or summer fallow should be all that is required in point of moisture conservation in the north-west. The seeding rains (May) were quite good, and the crop generally got a fine start, and although the rainfall dwindled towards the end of the growing period, the position was consolidated by good September rains, ranging from 178 points at Pallamallawa to 255 points at Turrawan. October weather was warm and dry, the crop ripening very quickly, and at the time of judging harvesting was well forward under eminently favourable conditions.

Varieties.

The six crops under review were made up of eight varieties, Waratah appearing three times, Canberra twice, and Aussie, Clarendon, and Florence each once, the winning crop being Clarendon. While it is not intended to unduly advance the claims of Clarendon for growth in the north-west, it is certainly a variety that is eminently suited to that district. For some considerable time past Canberra has been regarded as the standard early-matur-

ing type, but Clarendon, while being almost as early—within a day or two—is taller and stronger strawed. It holds its grain well, and is not usually over-troubled by rust, being partly resistant and partly rust-escaping owing to its earliness. It is of Bobs-Gluyas parentage, and can be safely accepted as a most desirable type. In spite of all this, however, Waratah is undoubtedly the wheat of the moment. The writer had the privilege of introducing this variety into the farmers' experiment plots in the Riverina in 1922, and since that time it has developed an extraordinary popularity. I have reliable information to the effect that fully 70 per cent. of the entries in the district competitions in the north-west during the past season were of Waratah. Compared also with Canberra, Waratah is stronger strawed and displays increased disease resistance.

Aussie (Federation x Gluyas) is another of the newer wheats that are likely to give excellent results in the north-west. It has already given high yields on the farmers' experiment plots, stands well, holds its grain satisfactorily, and is fairly rust-resistant.

It is interesting to note that all the abovementioned wheats have been produced by the Department of Agriculture, and are also definitely recommended to growers. It has been previously recorded that the north-western farmers are up to date in their selection of varieties, and it seems very evident that there has been no slackness in this direction over the past year. The wheats under review are all early maturers. This is, of course, a most important consideration in the selection of wheats for Australian conditions, and in a season with a dry finish, such as 1926, it was to have been anticipated that wheats of this type would stand out prominently.

Disease.

The common diseases of wheat were more or less in evidence throughout the championship crops. In every instance the seed had been treated with copper carbonate, and only one crop showed even a trace of bunt. Under present-day methods of control the presence of bunt is indicative of carelessness, and it is no longer regarded as a menace. Flag smut was present in most of the crops, but never very extensively, and it seems unlikely, owing to the climatic conditions mainly, that this type of smut will cause the losses over the north-west that it does elsewhere in the State. Loose smut was in evidence in several crops, but never severely. Foot-rot, however, seems to be more prevalent than formerly. Seasonal conditions were against the development of rust. The disease question is not acute in the north-west. Foot-rot and flag smut will yield to long bare fallow, and loose smut can be controlled fairly well by seed selection, without recourse to more elaborate methods. Altogether, average care and the observation of the simple rules laid down should be sufficient to maintain the crops of the north-west in health, in so far as the human factor operates.

Conclusions.

The outstanding feature of the whole competition as compared with those of previous years is the extraordinary improvement shown by the leading crops in type and purity of seed. North-western crops have been notoriously lacking in this regard, even so late as 1925, but there now seems to be a complete appreciation of the importance of the seed factor in wheat culture, and nothing else could so well emphasise the wonderful development that is going on over this portion of the wheat belt.

Further consideration of the problems of north-western wheat culture but serves to strengthen the opinion formed on previous tours that this district offers extraordinary—even unique—possibilities, and now that the great principles of seed improvement and tillage are being grasped by farmers generally the future of this great territory can be regarded with all confidence.

The aim must be to elevate the seed standard to that of the three placed crops in this season's competition. If this can be accomplished the seed factor will be at capacity, and coupled with the system of tillage already evolved (and largely practised in the north-west), and seasonable sowing of the correct varieties on fallowed land, must place the industry beyond the bounds of chance.

One point must be again emphasised, viz., that while short (summer), fallow is quite satisfactory in point of moisture conservation in the production of high yields, it is absolutely essential that every wheat paddock should have an occasional long fallow—possibly once in three years—in order that the control of weeds and diseases may be more complete; maximum yields are possible only in weed- and disease-free soils.

DETAILS of Awards in North-west Competition.

Society.	Competitor.	Variety.	Apparent Yield.	Trueness to type.	Freedom from Disease.	Evenness	Condition.	Cleanliness.	Total Points.
			bus.						
Gunnedah	J. Cavanagh, "Springhurst," Curlewis.	Clarendon	34	19	29	18½	9	26	135½
Moree ...	Cosh Bros., "Karoola," Pallamallawa.	Waratah ...	31½	19	28	17	9	28	133½
Narrabri ...	R. J. McWilliam, "Matoppo," Turrawan.	Waratah ...	29	19	29	18	9	27	131
Inverell ...	Waddell Bros., Oakwood	Waratah ...	33	18	27½	18	9	25	130½
Tamworth...	S. Forge and Sons, Oxley	Aussie, Canberra.	28	17½	28	18	9½	29	130
Wee Waa ...	T. Underwood, "Wire Lagoon," Wee Waa.	Canberra, Florence.	25	15	28	18½	9	27	122½

Varieties of Wheat and Other Cereals.

DEPARTMENTAL RECOMMENDATIONS FOR DIFFERENT DISTRICTS.

H. C. STENING, H.D.A., Chief Instructor in Agriculture

THE following are the latest departmental recommendations as to the varieties of wheats, oats, and barley best suited to various portions of the State :—

WHEAT.

Coastal Districts.

[Embracing districts which are specially subject to rust.]

For Hay—

Clarendon, Florence, Firbank, Gresley (early maturing varieties).

For Green Fodder—

Gresley, Florence, Firbank, Clarendon (early maturing varieties).

Sowing for hay should be made later than for green fodder.

Northern Tableland.

[Of which Glen Innes is representative.]

For Grain or Hay—

Genoa (early sowing);
Florence (mid-season and late sowing);
Clarendon (mid-season and late sowing).

For Green Fodder—

Genoa (early sowing);
Florence (early, mid-season, and late sowing);
Clarendon (early, mid-season, and late sowing).

Central Tableland.

[Of which Bathurst is representative.]

For Grain or Hay—

Cleveland (early and mid-season sowing);
Yandilla King (early and mid-season sowing);
Waratah (mid-season and late sowing);
Gresley (mid-season and late sowing).

For Grain only—

Federation (mid-season sowing);
Canberra (mid-season and late sowing).

Southern Tableland.

[Of which the Monaro, Crookwell, and Batlow districts are representative.]

For Grain or Hay—

Cleveland (early sowing);
Yandilla King (early sowing).

South-western Slopes and Eastern Riverina.

[Of which Wagga and Temora are representative.]

For Grain or Hay—

Yandilla King (early sowing);
Turvey (early sowing);
Gresley (mid-season and late sowing);
Waratah (mid-season and late sowing).

For Grain only—

Union (early and mid-season sowing);
Federation (early and mid-season sowing);
Canberra (late sowing).

For Hay only—

Zealand (early sowing).

South-western Plains and Western Riverina.

[Of which Deniliquin and Hillston are representative.]

For Grain or Hay—

Waratah (mid-season sowing);
Gresley (mid-season sowing).

For Grain only—

Federation (early and mid-season sowing);
Union (early and mid-season sowing);
Canberra (mid-season and late sowing).

Central-western Slopes.

[Of which Dubbo, Gilgandra, Wellington, Cowra, Grenfell, Forbes, and Parkes are representative.]

For Grain or Hay—

Cleveland (early sowing), especially suitable for the cooler portions of this district, such as Coonabarabran;
Yandilla King (early and mid-season sowing);
Turvey (early and mid-season sowing);
Gresley (mid-season and late sowing);
Waratah (mid-season and late sowing).

For Grain only—

Bena (early and mid-season sowing);
Federation (early and mid-season sowing);
Canberra (late sowing).

North-western Slopes.

[Of which Tamworth and Gunnedah are representative.]

For Grain or Hay—

Cleveland (early and mid-season sowing), especially suitable for the cooler portions of this district, such as Inverell and Delungra;
Currawa (early and mid-season sowing);
Yandilla King (early and mid-season sowing);
Waratah (early and mid-season sowing);
Clarendon (late sowing);
Florence (late sowing).

For Grain only—

Hard Federation (mid-season and late sowing), on light soils only;
Canberra (mid-season and late sowing);
Aussie (mid-season and late sowing).

Black-soil Plains.

[Of which Coonamble is representative.]

For Grain or Hay—

Canberra (mid-season and late sowing);
Florence (mid-season and late sowing);
Clarendon (mid-season and late sowing).

Western Plains.

[Of which Nyngan, Trangie, and Condobolin are representative.]

For Grain or Hay—

Improved Steinwedel (mid-season sowing);
Waratah (mid-season sowing);
Canberra (mid-season sowing);
Florence (mid-season sowing);
Gresley (mid-season sowing);
Firbank (mid-season and late sowing).

Murrumbidgee Irrigation Areas.

For Hay on the Irrigation Areas—

Marshall's No. 3 (early sowing);
Yandilla King (early sowing);
Zealand (early sowing);
Firbank (mid-season and late sowing);
Gresley (mid-season and late sowing).

For Grain on Dry Areas—

Federation (early and mid-season sowing);
Yandilla King (early and mid-season sowing);
Waratah (mid-season and late sowing);
Canberra (mid-season and late sowing).

OATS.

The varieties of oats recommended for various districts are as follows:—

North Coast.—Algerian (for grazing), Sunrise, Mulga.
South Coast.—Algerian, Guyra, Sunrise, Mulga, Myall.
Central Tableland.—Algerian, Guyra, Lachlan, Mulga.
Northern Tableland.—Reid, White Tartarian, Algerian, Guyra.
Southern Tableland.—Algerian, Guyra, Sunrise, Mulga, Myall.
Monaro.—White Tartarian, Algerian, Mulga.
South-western Slopes and Riverina.—Algerian, Lachlan, Sunrise, Belar, Mulga.
Central-western Slopes.—Algerian, Lachlan, Guyra, Sunrise, Mulga.
North-western Slopes.—Algerian, Lachlan, Guyra, Sunrise, Mulga.
Under Irrigation.—Algerian, Guyra, Sunrise, Mulga.
Western Plains.—Sunrise, Mulga.

BARLEY.

The varieties recommended by the Department are:—

Two-row type (commonly called "malting barleys").—Pryor.

Six-row type (commonly called "feed barleys").—Skinless for green fodder for winter and grain for stock in districts with mild winters. Cape and Trabut for green fodder, and grain for stock in the cooler districts.

The following are brief notes on these varieties:—

Trabut.—A rather short, compact-eared barley of the Cape type, with attractive yellow grain. About the same season as Cape.

Cape.—A verylargely grown six-row type variety, ripening early, and with long awns and grains of a bluish-green tint. Though usually regarded as a feed barley, bright samples are suitable for malting purposes.

Skinless.—Awnless, very early, grain very distinct in appearance, as the hull comes off in threshing.

Pryor.—This variety matures about the same time as Cape, and may be sown at the same time. It is a good variety for the wheat districts, as it may be harvested before wheat-stripping starts. It has a head like Kinver, but slightly shorter.

THE success of a farm irrigation system depends on the man with the shovel, and on him depends also the efficiency with which a quantity of water can be made to serve a given area of land.—L.C. BARTELS, Senior Irrigation Officer, Victoria.

Crop-growing Competitions, 1926.

EXTRACTS FROM THE JUDGES' REPORTS.

THE DUBBO DISTRICT*.

R. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

FIVE local associations within this part of the State carried out crop competitions this season, viz., Narromine, Gilgandra, Dubbo, Wellington and Cumnock. The entries at Narromine and Gilgandra were well up to and above the average of several seasons, but the response to the efforts of the Dubbo and Wellington Associations to encourage "better farming" methods was very disappointing.

Many good crops in each centre were known to be worthy of entry, and just because they happened, under the seasonal conditions prevailing at seeding time, to be a little dirty or weedy with wild oats, &c., the farmers concerned were not sufficiently interested in the efforts of their own P.A. and H. Associations to enter, and poor support was accorded a worthy progressive movement. The main object of these competitions is not necessarily to locate the highest yielding crop in the district, but to bring before competitors where their particular crops have failed, and where they could be improved on. In this era, when there is not a substantial margin between the cost of production and market value of wheat, the most sensible step seems to be an endeavour to lower the cost of production per bushel of wheat by trying to grow two bushels with the same amount of outlay where one only grew before. This objective may not be attainable, but it may be approximated, and that is more than half the battle.

The Season.

The season was somewhat comparable to that of 1925. Heavy rains during November, 1925, prevented the fallows from being worked to the best advantage owing to harvesting operations still having priority on most farms. Consequently weeds germinated and grew out of hand, and were difficult to deal with in the succeeding dry summer months. Mid-March saw the advent of torrential flood rains, which continued during April, giving aggregates for those months in excess of anything previously recorded. It was almost impossible to work any but the lightest country, or certain areas of well-drained soils which are to be found in the Narromine district; consequently weeds again got the upper hand and made the preparation of a good seed-bed a difficult proposition. Frequent showers during May further accentuated the position, and those farmers who were able to prepare and

* The judging of this and of all other crops referred to under this heading was carried out on the scale of points adopted for the championship. See page 97.—Ed.

sow between the rains were ultimately the fortunate ones. Practically every crop put in reasonably well during April or May gave good returns. From June onward to the maturity of the crops the rainfall was much below the average, and all late-sown areas suffered. Good rains in September assisted the well-developed crops materially, and temporarily relieved the position for the large area of backward crop, but as no further assistance of any materia benefit was forthcoming, the result was spindly growth and small ears.

Where the wheat plant is firmly established before winter with a good reserve of subsoil moisture it has been proved beyond doubt during the past two seasons that the plant is a hardy one, and will fill the ears well in spite of a dry spring.

RAINFALL Records.

Month.	Narromine P.O.	Gilgandra P.O.	Dubbo P.O.	Wellington.	Cumnock.
	points.	points.	points.	points.	points.
Fallow period—					
July, 1925, to April, 1926 ...	2,038	2,162	2,729	2,464	2,463
Growing period, 1926—					
May	251	323	339	296	370
June	121	186	138	87	134
July	93	62	104	109	164
August	105	73	162	100	195
September	160	226	155	190	173
October	28	71	56	44	73
Total...	759	941	954	826	1,109
Grand total	2,797	3,103	3,683	3,290	3,572

Cultural Details.

The majority of the crops were sown on fallowed land, this being one of the conditions of eligibility for championship honors in the R.A.S. competitions. While all the Associations did not restrict their entries to fallowed land, the majority did, and in no case were crops sown on stubble land prominently placed, in spite of the fact of big autumn rains.

The time of ploughing varied considerably from as early as March to as late as October-November, but apart from the important factors of aeration, bacterial activity, and climatic influences, all of which tend to increase fertility, the question of moisture content was evened up by the heavy and continuous autumn rains.

Time of Seeding.—It has been very noticeable during the past two years that early seeding pays. Quick-maturing varieties, such as Canberra, Waratah, Gresley, &c., sown in April, which in the light of past experience would seem to be courting disaster through being sown out of season, have done well escaped frost damage, and given high yields. This procedure is not advocated, but late-maturing varieties such as Yandilla King, Turvey, Marshall's No. 3, Bena, Penny, &c., sown early in April, followed by midseason and

early-maturing varieties in correct order, so that the seeding is completed by the end of May, appears to be a sound recommendation. This, of course, is affected largely by the prevailing seasonal conditions, and may have to be modified to suit the season. Sowings from mid-June onwards are seldom profitable, and it would generally pay much better to keep the seed and put the work into the soil for next season.

Amount of Seed.—The average amount of seed applied per acre in the various districts was as follows :—

	1925. lb.	1926. lb.
Narromine	45	48
Gilgandra	47	53
Dubbo	55	53
Wellington	56	55½
Cumnock	57	57

There is not any great variation, though there is a decided tendency to increase the seedings on the plain country at Gilgandra and Narromine, where in the past 45 lb. per acre of "bluestoned" seed was considered ample. Nowadays, with grading and dry treatment being universally adopted, the same 45 lb. is equivalent to not less than 55 lb. of ungraded "bluestoned" seed.

The following table illustrating the seed treatment is illuminating, as it shows how quickly the outstanding advantages of the dry copper carbonate treatment for seed wheat as a bunt or stinking smut preventive have been recognised by farmers, who are not slow to adopt anything to their advantage :—

District.	No treatment.	Dry treatment.	Wet treatment.	Total entries.
Narromine	......	13	5	18
Gilgandra	1	15	4	20
Dubbo	......	7	1	8
Wellington	2	9	......	11
Cumnock	......	9	5	14
Totals	3	53	15	71

In three crops the seed had been untreated, and in each case infection of bunt was more or less serious. A farmer is "penny-wise pound-foolish" who does not treat his seed, particularly as the objection of damage to germination has now been removed by the newer process.

Varieties of Wheat.

Nineteen different varieties were used by competitors in the crop entries. Popularity was well distributed, but thirty-eight farmers out of a total entry of seventy-eight used four well-known varieties, namely, Yandilla King, Turvey, Canberra, and Waratah.

The varieties placed in each of the competitions were as follows:-

District.	First place.	Second place.	Third place.
Narromine...	Yandilla King	Waratah	Yandilla King.
Gilgandra ...	Turvey	Penny	Canberra.
Dubbo	Waratah and Federation	Yandilla King	Yandilla King.
Wellington	Yandilla King	Yandilla King	Gresley.
Cumnock ...	Marshall's No. 3	Riverina	Imp. Purple Straw.

Though a number of varieties were submitted for adjudication, all are more or less popular in certain districts. For instance, Narromine, Dubbo, and Wellington farmers favour Yandilla King for their early sown late-maturing wheat, while Marshall's No. 3 does better in the Cumnock district, and Gilgandra farmers seem to favour Turvey. Similarly, in certain centres Riverina is taking the place of Canberra owing to its apparent high degree of resistance to flag smut. Wandilla is another wheat practically immune to attack by flag smut.

There is a tendency at times for writers to state that the older, slower-maturing wheats are gradually being replaced by quicker growing, sparse stooling varieties in the western wheat belt. This is not borne out by facts, and given suitable conditions at time of sowing, and adequate moisture, the older slower growers, such as Yandilla King, Marshall's No. 3, Turvey, Penny, &c., will consistently return the larger yields on account of their better stooling propensities.

Fertilisers.

Superphosphate as an aid to increasing yields is becoming more widely recognised every year, though it is by no means universally used as yet. Certain types of soils do not seem to require it, and there is certainly at present not the need for the heavy dressings used by the southern parts of this and other wheat growing States. On well worked fallow, where an adequate amount of moisture has been conserved, about 56 lb. superphosphate will in most cases more than repay the cost of application.

At Narromine only seven out of the eighteen entries received applications of superphosphate, the amounts varying from 30 to 60 lb.

At Gilgandra thirteen out of twenty entries were manured with an average amount of 57 lb. per acre.

In the Dubbo competition five out of eight crops had superphosphate at an average rate of 57 lb. per acre.

At Wellington, of eleven entries only five were manured, the average quantity being 50 lb. per acre.

The Cumnock competitors included nine out of fourteen entries which received applications of superphosphate at 47 lb. on the average. In this district on limestone country the average could safely be largely increased on allowed areas, as experimental work has proved.

Crop Diseases.

This season flag smut was very little in evidence in the crop compared with other years. It may have been that the wet autumn was favourable for the pre-germination of spores existing in the soil before the sowing of the wheat seed, thus lessening the chances of attack by the parasite. It seems that in the future the best methods of control will be along the lines of breeding and growing flag smut resistant varieties, such as Riverina, Nabawa, and Wandilla, but good work can also be accomplished by sound cultural methods to rid the soil of this pest.

On the other hand, foot-rot and take-all were much more prevalent this year than in other years, and here again it is thought that seasonal conditions, providing cold damp soils, may have been favourable to its abnormal development. All varieties are subject to these diseases to about the same extent.

Stem rust made its appearance in some heavy flaggy crops, but did no material damage, though a little more rain in the spring might have been disastrous.

Bunt has been dealt with elsewhere, and is now almost universally being effectively controlled by the use of dry copper carbonate.

CENTRAL WESTERN DISTRICT.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

The interest in wheat-growing competitions in the central western district continues unabated. Each season additional competitions are held, and each year their influence in improving methods of farming is more marked.

At the commencement of the fallow period heavy rain fell, the months of June and July averaging about 8·20 inches. This delayed the first ploughing considerably. The November fall was substantial, but coming at harvest time the benefit was largely lost. The summer months were very dry, the situation being relieved in mid-March, rain continuing practically from 17th to 31st of that month, from 5½ to 7½ inches being recorded. Wet conditions prevailed during April, May and June, great difficulty being experienced in sowing under decent conditions. The result was a reduced sowing throughout this area, an increase in "stubble" sowing, owing to the difficulty in getting on to fallowed ground, and, except where the conditions at sowing were satisfactory, an indifferent germination. August and September were considerably drier and the crops made excellent growth. October was dry throughout, the average fall for the district being about 80 points, and the first weeks of November were practically rainless. Despite the big rainfall on the fallow and in the early stages of growth, rain was badly needed towards the end of October to fill the grain completely. As it did not fall and several very hot days with strong winds were experienced, the grain did not fill as in the previous season and yields were not as high as was anticipated, pinched grain being much in evidence.

Analysis of the Competitions.

Competing Societies.—Competitions were conducted by the following associations:—

Grenfell P. A. and H. Association	28 entries
Cowra P. A. and H. "	23 "
Eugowra P. and A. "	10 "
Canowindra P. and A. "	19 "
Molong P. and A. "	5 "
Cranbury Agricultural Bureau	9 "

Varieties.—There were eighteen different varieties included in the ninety-four blocks inspected, and no less than forty-three crops of Waratah. The following table shows the behaviour of the most popular varieities :—

Variety.	Total.	First place.	Second place.	Third place.
Waratah	43	3	5	4
Bena	6	2	...	...
Yandilla King ...	11	1	1	...
Turvey	9	1	1	2
Canberra	9	...	1	...
Gresley	6	...	1	...
College Purple Straw	6	...	...	1
Marshall's No. 3 ...	4	1	...	...
Penny	2	1	...	...
Purple Straw ...	2	...	...	2
Federation	3	...	...	...

The popularity of Waratah is phenomenal, although in view of its performances in the last four years it appears to be justified. It is evident that Bena is a variety showing excellent exhibition qualities, particularly as regards yield.

The order of popularity is a safe basis of recommendation throughout the district under average conditions of soil, with the possible placing of Penny after Yandilla King in the Grenfell district. The limitation of varieties to three or four on the individual farm is recommended; they must be sown in their correct seasons.

Seed Treatment.—It is significant that 85 per cent. of the competitors adopted the copper carbonate method of seed treatment for bunt prevention, 7·8 per cent. used bluestone, and the balance formalin and other fungicides. All the winning blocks used copper carbonate, the only evidence of bunt in the blocks using this method being a trace in three or four. The benefits of using this method are many and are now fully realised by wheat farmers.

Quantity of Seed.—The average quantity of seed used in each competition was—Grenfell, 61·5 lb.; Canowindra and Cranbury, 60 lb.; Cowra, 56·5 lb.; Eugowra, 60·5 lb.; Molong, 56 lb The percentage using ungraded seed was very small. The winning blocks other than Molong used slightly more seed than the above averages.

Quantity of Superphosphate.—The average quantities of standard and of high grade superphosphate used in each competition were as follows:—

Superphosphate.	Grenfell.	Cowra.	Canowindra and Cranbury	Eugowra	Molong.
	lb.	lb.	lb.	lb.	lb.
Standard—17–18 per cent. ...	78	58·4	55	58	...
High grade—22 per cent. ...	71·3	56	58	65	62

Grenfell was easily the biggest user of high-grade superphosphate, 48 per cent. of the competitors using this grade.

There is quite a big rise in the quantity of manure per acre over previous years in the Grenfell district and a slight increase in other districts.

Results of experiments in these localities show the increase to be justified, and a more uniform application, approximating the Grenfell application, is recommended for the other districts. Quantities varied from 45 lb. to 112 lb. per acre.

Cultivation Methods.—Of the crops which occupied winning positions—

3 were first ploughed in June.
5 ,, ,, July.
5 ,, ,, August.
3 ,, ,, September.

The highest scoring of these were springtoothed soon after ploughing, again springtoothed and rigid-tined after the November falls, harrowed after the meagre falls in January and February, and springtoothed or rigid-tined (shallow) after the mid-March rainfall, and once or twice again before sowing.

The mouldboard plough is by far the most popular, 90 per cent. using this implement. More use appears to be made of the rigid tine (Wimmera scarifier) than in previous years, and it is a most desirable implement for working the fallows, its use being strongly recommended.

The number of summer fallows was five, and wider adoption of this method of preparation is justified.

Diseases.—Fungus diseases were not very much in evidence, except in about 9 per cent. of the blocks. Take-all and foot-rot were easily the most prevalent, while flag and loose smut were lighter in their attacks than for many years. The moist conditions prior to sowing were no doubt responsible for the mildness of the attack of flag smut. The septoria fungus was noticeable in some places, and rust made its appearance in the Canowindra crops.

Trueness to type and purity.—The standard of the crops as regards type and purity was higher than in previous years; in fact, the most noticeable improvement in competitors' blocks has been in this respect. The averages

of the points awarded all the competitors' blocks in each district were—Grenfell, 18·8 points ; Cowra, 18·7 ; Canowindra, 17·2 ; Cranbury, 17·5; Eugowra, 17·2; Molong, 17·7.

It is evident that wheat-growers are well aware of the loss in growing wheat that is impure and not true to type. Owing to the establishment of pure seed areas with members of the Agricultural Bureau, it is anticipated that a big improvement will be seen when the influence of these areas is felt.

Cleanliness.—Only one block secured the maximum number of points for freedom from weeds, although a number scored within 1½ to 2 points of the maximum. Cleanliness is, however, very largely a matter of conditions at and prior to sowing, and the extremely wet conditions which prevailed at sowing time made it most difficult to grow weed-free crops. Black oats were, of course, the most conspicuous weed, and an early start will be necessary this coming year to induce germination and destruction of this pest. A good burn, a shallow discing in March, and continual destruction of stray plants when young by implements and sheep is recommended.

COONABARABRAN.

R. G. MAY, H.D.A., Manager, Bathurst Experiment Farm.

Ten crops were submitted for inspection. The winning crop was of a high standard, and reflected great credit upon the grower, Mr. James E. McDonald, of "Westover," Ulimambri. It is unfortunate that the competition is arranged for areas of 30 acres of crop only, instead of 50 acres as is required to entitle the winner to compete in the Royal Agricultural Society's Championship competition.

The Leading Crops.

The crops gaining first, second, and third places are worthy of comment. Each was grown on new land, the varieties chosen being respectively Yandilla King, Waratah, and Hard Federation. Each crop was dense, even, well headed and well filled, the maximum points for yield being given in each case. The final results depended upon a strict allotment of points under other headings.

Mr. McDonald's winning crop of Yandilla King was sown in late April, 70 lb. of ungraded seed treated with a proprietary bunt preventive being used. It was particularly free from black oats and weed growth. The crop had stooled freely, clearly showing that much of the seed sown had not germinated. Usually, in grading seed, approximately from 20 per cent. to 30 per cent. of the bulk, consisting of broken, shrivelled or small grain, and weed seeds, rubbish, &c., is graded out, all of which has been purchased at seed wheat prices and has entailed higher freight, cartage, more bags and handling, &c., and is finally unproductive.

The crops placed second and third, grown respectively by Mr. Alfred Power (Waratah) and Mr. Thomas Power (Hard Federation) were similarly dense and well stooled, though in each case only 40 lb. of graded seed were sown. The crop of Mr. Alfred Power lost points through the prevalence of thistles which were distributed throughout the crop, while Mr. Thomas Power's crop of Hard Federation lost points by the presence of Cape barley; it also showed the effects of damage, in patches, by aphis, straws kinking where attacked and breaking off. This was not noticed in any other crop, though signs of aphis presence were marked in several localities. Although dense and well grown, the three leading crops showed very little lodging, such being confined to small isolated patches on the heaviest areas.

General Comments.

The estimated yields of crops inspected ranged from 27 bushels to 40 bushels per acre. The lower yields were due mainly to the short headed character of the crops, the lower spikelets failing to develop. In some crops the average number of filled spikelets ranged from twelve to fourteen per head, while in the winning crops from eighteen to twenty-two spikelets were developed. The grain throughout promised bright, plump and clean, except on lodged areas, where reduction in yield, due to lack of plumpness, was evident Rutherglen bug was attacking the heads of lodged areas in several crops while in others ladybirds were thickly crowded, actively destroying aphides. Mention is made of this because in several instances these useful insects were miscalled pumpkin beetles—a very destructive pest.

The crops generally were true to type, though natural crosses and strangers were evident. The attention of the growers is being given to pure seed, and its use throughout the district seems assured. Among the competing crops only that of Mr. Charles Byrne of Mullaley was fertilised, 73 lb. superphosphate per acre being applied. The weather experienced caused this crop to lodge freely before the heads were filled, thus reducing the prospects of a heavy yield considerably. The use of superphosphate in the district shows an inclination to spread and become more general.

All crops inspected were very free from disease. In most instances red rust had been present but had practically disappeared. Flag smut and loose smut were not present to any extent, affected plants being difficult to find. Bunt was practically absent. Only slight traces of take-all, foot-rot and wheat blight were noticed. The practice of treating the seed with either a dry or a wet pickle was general.

The crops were uneven in maturity in several instances, due mainly to the weather experienced causing unequal development of stooling. Black oats and undesirable weeds were present to a moderate extent, the most prevalent weeds being black thistle, slender thistle, Mexican poppy, wild mustard, Maltese thistle (saucy jack) and variegated thistle. Of the crops submitted for competition 50 per cent. were sown on new land, 30 per cent. on fourth crop land, the remainder on land on which six or more crops had been grown.

The season experienced undoubtedly favoured the production of such good crops as were inspected. In ordinary seasons the adoption of proper fallowing methods with the use of superphosphate will raise the standard of wheat-growing and ensure a higher average yield throughout the district. Two competitors only, Messrs. Alfred and Thomas Power, winter fallowed their crop land; all other competitors short summer fallowed or ploughed their land just prior to sowing.

PARKES AND ADJACENT COMPETITIONS.

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

It is rarely indeed that wheat growers experience favourable conditions throughout the fallowing and growing periods, as there are generally some months in which the rainfall exceeds or is short of requirements, or in which late frosts or strong drying winds occur. Each year the reports upon crop competitions contain some reference to such yield-reducing influences, which, after all, are the factors that make better farming practices necessary and the lessons brought to light by the results of the crop competitions so valuable.

The past season has been no exception, and at certain periods farmers were confronted with difficult situations, but the average acre-yield has nevertheless been considerably above the average. Exceptionally heavy rains (650 points) in June, 1925, and frequent light falls in July kept the ground too wet for fallowing. From July to February, except in November, the monthly rainfall was below the average. The soil set very hard by September, and such conditions made the ploughing of the fallow difficult. Very welcome rains commenced in March, and the prospects of ideal seed-beds were bright, but with the continuation of the rain into April and May, the prospect became dimmed, to disappear as far as seeding conditions were concerned, farmers being up again t the most difficult sowing period experienced for many years. It was impossible to kill rubbish, as cultivation merely transplanted the weeds, and in the end considerable areas were sown in wet to boggy soil. Large areas of well prepared fallow were not sown, and the crop acreage over the area embraced by the competitions was 21·4 per cent. less than that sown in 1925.

From June onwards each month's rainfall was below the average, with a particularly dry period in September and October, just when rain is most needed to fill the heads. With such conditions, crops of below average yield might have been expected, but such was not the case. Most crops sown prior to the middle of May made splendid growth, and though in some cases they were dirty with rubbish, they were dense, and headed and filled remarkably well, only slight pinching of the grain occurring in the rankest patches. Even some crops which ripened with a green tinge in the straw—a drying process rather than a ripening one—matured grain of f.a.q. sample.

The late sown crops did not fare so well and were rather thin, though they headed and filled satisfactorily.

The rainfall as registered at Parkes post ffice gives a general indication of the rainfall conditions over the area concerned. Some centres showed variations, but not sufficient to warrant special mention, excepting for the country west of Bogan Gate and Trundle, which experienced a fall of from 1 to 2 inches during October that aided considerably in filling the crops. The registrations at Parkes were as follows :—

Fallow Period.		Growing Period.	
1925.	pts	1926.	pts.
June	650	May	314
July	169	June	180
August	110	July	140
September	44	August	180
October	94	September	88
November	279	October	30
December	138		
1926.		Total	932
January	182		
February	111		
March	783		
April	334		
Total	2894		

Superphosphate.

The average quantity of superphosphate per acre applied to crops in the competitions over the last three years has been as follows :—

Locality.	1924.	1925.	1926
	lb.	lb.	lb.
Parkes	54	68	74·4
Forbes	53·5	54	66·4
Trundle	50	51	52·1
Tullamore	...	...	49·4
Peak Hill	...	47	64·5
Bogan Gate	...	52	64·1
Coradgery	42	52	57·8

The figures show that in every locality the farmers are each year increasing the amount of superphosphate applied per acre. The rather remarkable increase in the past year is no doubt due to the purchase of high-grade superphosphate and the application of the same quantity as when standard superphosphate was used. Even so, as will be shown by another table, heavier applications still are apparently justified, irrespective of whether the soil is of the heavy rich type or of the lighter kind of loam.

Seeding.

Reference to the amounts of seed used per acre when sowing the competition crops in the different centres of late years shows a decided increase in the Parkes district (from an average of 52 lb. for all competition crops in 1924, to 56 lb. in 1925, and 59·6 in 1926). The amounts used in other localities

have been fairly constant during the past three years, but are much greater than those used a decade ago. The proportion of early sown, late maturing, and better stooling wheats was greater in 1926 than in 1925, and, requiring less seed per acre, they reduced the average quantity of seed per acre accordingly. As only graded pure seed is now sown, and copper carbonate is the universal seed treatment, it is evident that farmers are aiming at thicker crops than in past years. The averages of the seven leading crops in the Parkes competition indicate that the rate of seeding may be still further increased.

Seed Treatment.

Areas demonstrating the value of the dry copper carbonate method of treating seed wheat for bunt prevention were first established on farmers' experiment plots in the western district in 1923. At that time not one farmer was using the treatment. The results being proved satisfactory, the treatment was adopted by some farmers in 1924. The percentage of competition crops so treated increased from 41 per cent. in 1924, to 72 per cent. in 1925, while in 1926 85 per cent. were dry treated. Throughout the judging of this year's competitions in this district not one head of bunt was found.

The Varieties Used.

Canberra and Waratah (in that order but with little between them) were easily the crops most frequently exhibited in 1926. The proportion of Canberra crops exhibited in the competition during the past three years was as follows:—1924, 28 per cent.; 1925, 38 per cent.; 1926. 23 per cent. The proportion of Waratah in the competitions was: 1924, 3·5 per cent.; 1925, 13·4 per cent.; 1926, 21·6 per cent. The number of varieties exhibited in 1924 was 24·7 per hundred crops; in 1925 it was 18·5 per hundred crops, and in 1926 it was 25·5. The proportion of late varieties in 1924 was 29·4 per hundred crops; in 1925 it was 13·4 per hundred crops; and in 1926 it was 30·3.

The placing of the varieties in the seven competitions was as under:—

Variety.	Firsts.	Seconds.	Thirds.
Waratah	3½	...	1
Canberra	½	3	...
Turvey	1	2	...
Bena	1	...	1
Yandilla King	...	2	1
Federation	½	...	...
Quality	½	...	...
Gresley	...	...	1
Marshall's No. 3	...	...	1
Florence	...	...	1
Hard Federation	...	...	1

With a total of ninety-four entries, twenty-four different varieties were submitted to the judges for inspection. The advantages to be gained from a reduction in the number of varieties in cultivation are great and are widely

recognised, but the difficulties of effecting a reduction also appear to be great, as very little headway, if any, has yet been made. The varieties that have attracted most notice are Waratah and Bena. Waratah has been successful throughout the State, and has displaced large areas of the Canberra variety. In this portion of the western district the areas of Waratah and Canberra wheat submitted for inspection were almost equal, and the honors were with Waratah. Bena made its first appearance in the competitions this year, and scored first and third positions at Parkes. The winning crop, grown by Mr. H. K. Nock, of Nelungaloo, was estimated to yield 46 bushels per acre, and before a gale of wind caused damage it was stripping 44 bushels per acre of bright, plump grain. It was the highest yielding competition crop grown in the west, and probably in the State, this year. This variety will probably displace many of the later maturing wheats.

The increase in the proportion of later maturing wheats exhibited is due to autumn rains falling in March and sowing commencing in April, and it aptly illustrates the importance of having seed of these varieties on hand to take advantage of such conditions.

Working of the Fallows.

The percentage of crops grown upon fallowed land was 88·3. Of late years there has been a marked improvement in the working of fallows, particularly as regards the number of workings:—

Locality.	Average Number of Times Fallows Worked.		
	1924.	1925.	1926.
Parkes	3·9	5·4	5·4
Forbes	3·8	4·0	4·9
Trundle	3·0	3·7	2·9
Tullamore	...	...	3·2
Peak Hill	...	2·7	3·7
Bogan Gate	...	3·0	4·5
Coradgery	3·5	2·7	2·7

During the late autumn and winter of 1926, fallowed land presented many difficulties, owing to weed growth, and the wet condition of the soil. Many farmers had to leave out their fallowed land and hurriedly prepare stubble land, and they generally secured good seed-beds in that way. As all country was thoroughly saturated, many considered that the crops on stubble would compare well with those on fallow. Even so, the competitions have shown that very few stubble-sown crops were worthy of entry, and that frequently worked fallows produced the heaviest yielding crop.

Diseases.

It is very evident that good farming is having a remarkable effect upon disease control. In the western district crops were very free from all the wheat diseases, and it was at first thought that the seasonal conditions were

the main contributing factors in such control, but during the judging of competitions in two other localities where crop competitions have not previously been promoted and where farming practices are not good, several crops came under inspection in which the diseases of foot-rot and take-all had taken from 30 to 50 per cent. of the crop yield. Seasonal conditions do help, but are not effective unless aided by farming practices.

Pure Seed.

The system of pure seed wheat supply established in the western district in 1924 is having a very marked influence upon the quality and yielding power of the western crops. At Forbes a demonstration came under notice in which pure seed was estimated to give an increased yield of 4 bushels over that of ordinary farm seed. From the 1925 pure seed crops the western pure seed wheat growers sold over 34,000 bushels of seed wheat, and this year 47,000 bushels are available for sale.

The Parkes Results.

The foregoing clearly shows that the leading farmers throughout the west are increasing their acre yields by increasing (1) the number of times the fallow is worked, (2) the amount of superphosphate applied per acre, and (3) the amount of seed applied per acre, and also by the use of the dry copper carbonate method of seed treatment and relatively early sowing. But a more striking illustration of these facts is afforded by comparing the averages of the seven leading crops with the twelve supplementary crops of the Parkes competition :—

	Average of Seven Leading Crops.	Average of Twelve Supplementary Crops.
Yield per acre	38·6 bushels ..	29·25 bushels.
*Superphosphate per acre	83·6 lb.	69·25 lb.
Seed per acre	63 lb.	57·7 lb.
Times fallow worked ...	6·6	4·75
Date sown	5th to 20th May ...	5th April to 2nd June.
Seed treatment	All copper carbonate.	All except one copper carbonate.

* In terms of standard superphosphate.

The table indicates that, provided fallows are well worked, early maturing wheats may be sown about the first to second week in May, using 60 lb. of graded copper carbonate-treated seed, and 80 lb. superphosphate per acre.

TAMWORTH.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

Of twenty-two entries in this competition this year, twenty-one remained in for adjudication. In most instances the type was good, and in only a few entries was there serious admixture of varieties. Loss from shattering sometimes occurs when the "stranger" is earlier and when later maturity causes delay in harvesting.

Disease Occurrence and Prevention.

The efficacy of copper carbonate dusting in bunt prevention was strikingly illustrated. In one or two instances of bluestoning on the haphazard method of judging the strength of the solution by its colour, and in another instance where the amount of bluestone in the solution was uncertain, there was one bunted head in every two yards. Slight infection of bunt occurred even where the right strength was used. The dusting machines which blew the copper carbonate powder forcibly against the grain were preferred.

Flag smut generally only occurred as a minor infection; in some crops it was not present. Only in one crop was stem rust found and that a light attack in Rymer variety. Foot-rot and take-all were in evidence in every crop, but the damage caused by them was least on long fallow. None of the crops followed oats; but the known benefit of rotating oats as well as long fallow with wheat in ridding the soil of these diseases and flag smut will in all probability receive a further test next year, as a considerably greater number of farmers have a portion under oats this year than previously.

Uneven Crops.

With one or two exceptions the outstanding weakness in the entries was a deficiency in evenness. The stand was especially faulty. Better covering and packing of the soil about the seed is needed, especially in the self-mulching types of soil, which are fairly general in the Tamworth district. It will be found advantageous to drive a mob of sheep over the field after sowing in addition to harrowing, within about a week from sowing if moisture is not ample. Uneven stooling and height was also pronounced in some instances; this was partly due to the effect of take-all and generally to unfavourable soil and weather conditions, depth of planting, and quality of seed.

Weeds.

Generally wild oats were very little in evidence, but thistles, especially black, variegated, and saffron, were present in a dwarfed condition, and owing to lack of density, these would have made havoc with a few of the crops had normal spring rains occurred.

Because of the light rainfall in the winter very few of the crops were fed off. As early spring was even drier, growth was still further held in check. With normal rain conditions in August and September, lodging, with its attendant

loss, delay and worry, would have in all probability exceeded that of 1920 harvest. Actually but little crop lodged, although some stood 5 feet high. There was no evidence of detriment where feeding-off had occurred.

With the exception of two crops, the stage of maturity warranted the assumption that good quality grain would be harvested. Any shrivelling or pinching will be mainly due to the effect of foot-rot and take-all.

WAGGA.

E. S. CLAYTON, H.D.A., Senior Agricultural Instructor.

Thirty-two farmers entered for the various competitions conducted by the Murrumbidgee P. and A. Association this year, but seven withdrew.

The crops were all of a very high standard, and it was a pleasure to inspect so many excellent crops in all parts of the district. The season was very favourable and crops had not suffered from lack of moisture. In fact the reverse had been the case, too much rain having been received during the winter months, so that low-lying, badly-drained areas were waterlogged to the detriment of the crop. Weed growth (particularly Cape weed and black oats) was hard to destroy on account of the frequent rains in April and May. It was a tricky season and one in which it was very easy to make a mistake at sowing time. Crops that were sown while the land was too moist or before the weeds had been destroyed turned out very badly. This season forcibly demonstrated the necessity of sowing only when the land is in a fit condition. Judgment must be used at this period so that the seed goes in under good conditions. All the beneficial results of good fallowing can be nullified by lack of care at sowing time. It is better to give two or three cultivations with a rigid tine scarifier or springtooth cultivator prior to sowing to destroy weeds than have black oats and Cape weed competing with the crop. With all the leading crops it was noted that the land was carefully prepared prior to sowing so that the wheat had every advantage against the prolific growth of black oats and Cape weed which the wet season induced.

Farming Methods.

The standard of farming in the Wagga district is very high, methods varying according to the different soils and situations. Where a few years ago only one or two men could be found in each portion of the district whose methods stood out above the others, such is not now the case for many men are to be found in all parts of the district who adopt advanced cultural methods. The majority of the competitors practised heavy seeding (60 to 90 lb. of graded seed per acre), and heavy manuring (90 to 130 lb. of high-grade superphosphate per acre) and almost all had adopted the dry copper carbonate treatment for preventing bunt. Most of them were growing very suitable varieties and were also sufficiently keen to inquire about any

new varieties likely to suit their particular conditions. There is a strong tendency towards very early burning of the stubble and long summer fallowing.

Mr. Heffernan, who won the whole farm competition over 300 acres, had long summer fallowed one of his paddocks. The stubble had been burned early and the land disc cultivated in March, 1925, then scarified (rigid tine) in September, 1925, again in November, 1925, and again in January, 1926, again in April, then springtoothed prior to sowing with a combine. Another paddock had been ploughed witha mouldboard plough 4 inches deep in June, and harrowed afterwards. All Mr. Heffernan's crops were particularly good. His Yandilla King and Marshall's No. 3 were very free from disease and exceptionally clean. He grew 40 acres of Algerian oats and 354 acres of wheat, the varieties being Yandilla King, Marshall's No. 3, Warden, and Zealand. The oats were sown at 2 bushels per acre with 70 lb. of high-grade superphosphate; the wheat at 75 lb. per acre with 112 lb. of high-grade superphosphate.

Mr. Steve Kanaley, who won the combined fallow and crop competition and the competition for farm of growing crops under 300 acres, also adopts sound agricultural methods. One paddock had been summer fallowed. The stubble had been burned early and the land disc cultivated in March, 1925; it was ploughed in August with a mouldboard plough, 4 inches deep, then harrowed, scarified (rigid tine) in November, harrowed in November, again in January, scarified again in April and sown with a combine on the 19th May with Bena and Waratah, at 70 lb. of seed per acre with 112 lb. of high-grade superphosphate. All the seed had been treated with copper carbonate and of course was graded. All the competitors used graded seed. Mr. Kanaley had Yandilla King, Baroota Wonder, Bena and Waratah. All his crops were very true to type, practically no disease was present, and the crops were clean.

It will be observed that Mr. Heffernan and Mr. Steve Kanaley both long summer fallowed one of their paddocks, but in a slightly different manner. Both disced the land in March; then Mr. Kanaley ploughed his land in the late winter while Mr. Heffernan did not plough his fallow at all, but relied on the rigid-tine scarifier to put his fallow into good condition. Both of these systems are correct, but the winter ploughing is preferable as it turns under and completely destroys the prolific March growth; in addition to this the soil is aerated to a greater extent by the ploughing. Long summer fallowing without ploughing is often profitable on the lighter types of soil, but even on these soils it is not advisable to take off two consecutive crops without ploughing; the land should at least be ploughed for every second crop.

Mr. McEwin, the winner of the competition for 50 acres of wheat for grain, had a particularly good crop of Waratah. It was very true to type, had very little disease, was even and clean and was estimated to yield 36 bushels

per acre. The land had been ploughed in June with a mouldboard plough 4 inches deep, harrowed in August, portion disced and portion springtoothed in October, springtoothed again in March, again in April, again in May before sowing and harrowed after sowing. The Waratah had 75 lb. of seed (treated with dry copper carbonate) and 90 lb. of high-grade superphosphate per acre.

The winner of the oats (25 acres) competition, Mr. A. Lewington of Uranquinty, had 240 acres of Algerian, which had been sown at the rate of 80 lb. of seed (treated with dry copper carbonate) and 70 lb. of high-grade superphosphate per acre. It was a particularly fine crop, showing hardly any smut, no undergrowth, practically free from wild oats, and was estimated to yield 58 bushels per acre. Mr. Gorman had a particularly nice crop of 120 acres of Algerian oats on stubble. It had been sown at the rate of 2 bushels per acre (seed treated with formalin) and 65 lb. of high-grade superphosphate, and it was one of the finest and most even oat crops I have ever seen produced on stubble land.

Mr. J. Blackwood won the wheat for hay competition with a very fine crop of Turvey which was estimated to yield 3 tons per acre. It was grown on very fertile country—country that is ideally suited to the production of heavy hay crops.

Varieties.

During the past few years Waratah has been rapidly gaining in favour until at the present time practically every farm in this district has a fair area of this variety. It can definitely be stated that it is one of the most suitable grain varieties for this district for midseason and late sowing. It should not be sown early; the most suitable date is during the last three weeks in May, though if necessary, it can be sown as late as the first week in June. It is not a profuse stooler, and heavy seeding should be adopted. From 70 to 90 lb. of graded seed is advisable.

Turvey is certainly one of the most valuable varieties for this district and some very fine crops of it were seen. It is an excellent dual-purpose wheat—particularly in the Wagga district. It should be sown early at the rate of 60 to 75 lb. of seed per acre. It is not advisable to sow it later than the first week in May in normal seasons. Most of the Turvey crops seen were reasonably true to type and pure.

Other varieties frequently seen were Yandilla King and Baroota Wonder, but while these varieties are suited to many portions of the district they cannot be universally recommended for the whole district in the same way as Turvey and Waratah. Bena is a variety that is gaining in popularity. Some good crops of it were seen, and it is thought that, as it is fairly short in the straw and stands up well, there is a place for it in this district where there is a tendency for crops to grow too tall for grain. For early hay crops Baroota Wonder and Firbank are particularly suitable.

Diseases.

There was very little disease noticeable this season. A little flag smut was to be seen in most of the crops, but as a rule it was not sufficiently prevalent to reduce the yields to any extent. Oat smut was not nearly so noticeable as usual, chiefly because most of the seed had been pickled. For this purpose formalin is the best treatment. Mr. Gorman treats his oat seed with formalin, and he finds no difficulty in sowing the seed after 24 to 36 hours have been allowed for it to dry out.

Sheep on the Fallows.

Every competitor had grazed sheep on his fallows to keep the weed growth down and reduce the number of cultivations, and it can be accepted now that most farmers are fully awake to the great value of sheep in this respect. Their tramping over the fallow helps greatly to compact the subsurface soil, which is very necessary to the growth of heavy wheat crops. By eating all the black oats, weeds, &c., on the fallow they often obviate the necessity of cultivating the fallow at a busy time, such as in the middle of harvesting. Heavy stocking of the fallow is advisable; in fact some Wyalong farmers keep a special flock of wethers just for this particular purpose. They find that wethers stand this treatment better than mixed sheep. The fallow is closely grazed till it is bare, and the sheep are then removed to good pasture where they rapidly improve in condition, when they are again ready for heavy grazing on the fallow. These farmers sacrifice the sheep a little in order to improve their wheat yields.

A point worth keeping in mind is that the usual practice of grazing sheep on wheat stubble infected with flag smut and then putting them immediately on to the fallow will increase the amount of flag smut in the succeeding crop. It is advisable to graze the sheep for about seven to ten days on pasture before putting them on to the fallow, so that it will not be infected with flag smut from this source.

"Testing Milk and Its Products."

The author of this book, Mr. G. Sutherland Thomson, of Aberdeen and Glasgow University Colleges, was formerly prominently associated with official dairy work in South Australia and Queensland, and his approach to the subject is therefore essentially sympathetic. Testing for butter-fat is now recognised as a very important branch of dairy education, and as time advances the marketing of dairy products on their nutritive and health-giving content will be more seriously considered. The book in a popular way states the chemical analysis of milk, describes methods of testing milk and cream—especially the Babcock method—and then indicates methods of estimating acidity and calculating the dirt and bacteria content of milk, and deals with various related subjects.

Our copy from the publishers, Crosby Lockwood and Son, London.

Field Trials With Oats.

BATHURST EXPERIMENT FARM, 1920–25.

R. THOMSON, H.D.A., Experimentalist.

THE value of oats as stock feed, both as grazing and as grain, is being recognised more and more, while as a rotation crop in wheat land they are steadily gaining favour. In view of this, the results of variety trials carried out here during the past six seasons should be of interest.

The soil is a granite loam overlying clay. The annual rainfall is 23 inches, the greater part of which falls in the late autumn and during the winter. The general practice is to sow oats for grain or hay after a bare fallow or a fodder crop, the residues of which are ploughed under in October.

Sowing takes place during the second or third week in May, at the rate of 1 bushel of seed and 56 lb. superphosphate per acre. The crop is cut with the reaper and binder, and in an average season harvesting is finished just before Christmas.

The yields for the past six years are shown in the following table :—

Variety.	1920.		1921		1922.		1923.		1924		1925		Average	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Algerian	40	20	39	20	48	36	45	20	45	30	20	29	40	19
Guyra	44	26	36	20	49	36	39	28	56	16	24	23	41	57
Lachlan	30	34	37	36	39	24	39	16	41	36	...		37	37
Ruakura	30	33	37	4	40	20	54	25	45	2	...		41	25
Sunrise	30	33	26	4	41	20	39	16	41	36	19	2	33	5

Notes on Varieties.

Algerian.—Best all-round oat for the district, suitable for grain or hay, and stands grazing well; fairly late maturing; stools well.

Guyra.—A good grain variety, earlier than Algerian; stools well, upright growth, strong straw; very plump grain.

Lachlan.—Very similar to Guyra, more suited to hotter districts.

Ruakura.—Fair yield of grain; stooling only fair, straw weak; midseason maturing.

Sunrise.—Early maturing, poor stooler; sometimes used for early fodder, but will be replaced by Mulga (at present under trial).

Wheat-growing in the South-west and Riverina.

[Concluded from page 11.]

E. S. CLAYTON, H.D.A., Senior Agricultural Instructor.

After Treatment of the Crop.

THE harrowing of the growing crop when it is about 6 inches high is coming more into favour. Harrows certainly drag a few plants out, but when the stand is not already too thin no damage results, as the increased vigour of the crop and the better stooling induced more than make up for any disadvantage. In years when heavy winter rains have fallen, and on heavy land which is inclined to set hard, harrowing in early spring is very beneficial. Harrowing breaks this surface crust and also destroys many weeds. It is also of great advantage even in normal years on all classes of soil in the drier parts of the State, as it helps to conserve moisture by producing a surface mulch. On heavy land, harrowing should be completed early in spring, otherwise the land is inclined to become so hard that the harrows will hardly mark the surface.

Rolling is sometimes practised when the crop is 6 to 8 inches high if it is intended to be cut for hay or silage. This is only done to level the surface. Rolling is beneficial on many of the light open soils, especially on the light sandy mallee lands, as it assists in consolidating the soil. Farmers on this class of land would improve their yields by rolling the growing crop. On very heavy soils rolling is not so beneficial.

Feeding-off Wheat Crops.

Now that the maturity of most of our varieties of wheat is known to farmers, varieties are usually planted at the right time. There is therefore very little actual necessity to feed off growing crops, as they do not now get too far advanced except in certain seasons. There are many farmers, however, who pay as much and even more attention to sheep than to wheat growing, and wheat crops are frequently sown early with the deliberate intention of feeding them off with sheep. This is particularly the case when fat lamb raising is engaged in. If it is found that feed is scarce, full use is made of the wheat or oat crop for feeding the sheep; if not, the sheep are withdrawn and a hay or grain crop is harvested.

Each individual farmer must decide which is to be his chief consideration—the sheep or the wheat crop. The season, the probable price of wheat and wool, and the area and situation of the property must be taken into consideration. It can be definitely stated that in normal seasons and provided the variety has been sown at the correct time a better wheat yield will be obtained by not feeding the crop off. The yield is usually

reduced a few bushels per acre according to the duration of the feeding off. Where crops have been sown too early and have grown too rank in the early stages it is, of course, of advantage to feed off.

If the crop is to be fed off it is advisable to feed it off as quickly as possible. The more sheep available for the purpose the better, so that the crop can be fed off within a week or two and the sheep removed. Southern farmers are advised not to feed off any later than 30th June, or the resultant wheat yield will be reduced, particularly if, as is frequenzly the case, a dry spring is experienced. Do not feed off a dirty crop or the weeds may outgrow the wheat. Sheep should not be left on a crop when the land is wet or boggy. It is advisable always to harrow the crop immediately after feeding off.

Wheat Grown for Feeding-off.

Wheat and oats are frequently sown for the special purpose of feeding off. When this is the case late-manuring varieties, such as Yandilla King wheat or Algerian oats, should be chosen. These varieties, if sown early in the season (say in March or April), will withstand a tremendous amount of grazing, and if the sheep are removed before July a satisfactory grain crop may be harvested.

When sowing crops specially intended for feeding off it is advisable to increase the quantity of superphosphate and also of seed. The heavy application of superphosphate induces deep vigorous rooting and enables the plants to withstand the harsh treatment of feeding off without being pulled up. In addition the crop will recover much more quickly in the spring if the application of superphosphate has been liberal.

Sheep on the Wheat Farm.

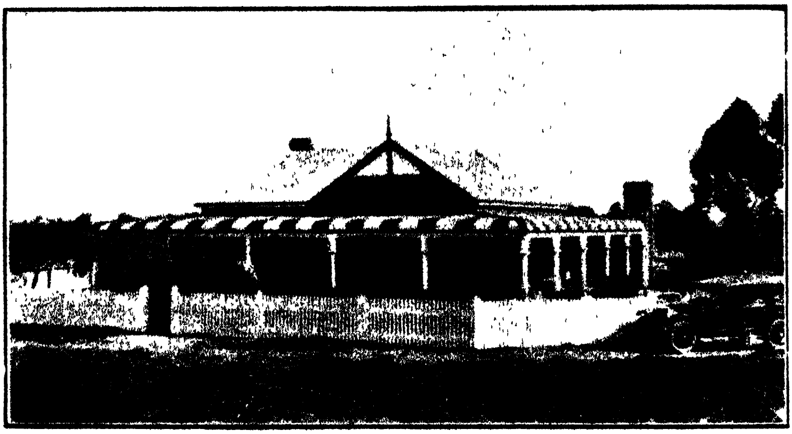
Every wheat grower should certainly keep a flock of sheep to assist in the effective working of his farm. Definite advice cannot be given as to the actual number of sheep to be carried, as this depends on the class of country and the locality. It is not proposed to deal exhaustively with this subject, but the question of feeding is worth emphasising.

To carry the maximum number of sheep the wheat farmer should put down two or more 100 ton pits of silage; either wheat, oats or barley can be used. If this is done it greatly assists in the economical working of the farm, and sufficient sheep can always be carried to make use of the stubble and rubbish growing on the fallows without the necessity for keeping a large area of grass as a reserve in case of a drought year. In addition to this numerous farmers are now erecting galvanised iron silos to hold oats for feeding sheep and horses during periods of drought. The usual size of silo for this purpose holds 300 bags of oats. These silos are becoming very popular and are to be found now in most districts. They are very numerous around Barellan. Silage in pits and oats stored in overhead silos are the best insurance against drought losses, and together with fallowing they place the business of mixed farming on an absolutely safe basis.

Wild Oats.

So much has already been written by departmental officers on the subject of wild oat destruction (concerning which pamphlets are available) that it is proposed merely to emphasise a few factors which have been discussed elsewhere in this article, namely, summer fallowing and heavy seeding and manuring as a means of overcoming the pest.

If summer fallowing as described previously is carried out it will be found of enormous assistance in the destruction of wild oats; in fact quite remarkable results have been obtained with this system, and if it is accompanied by heavy dressings of seed and superphosphate (60 to 80 lb. of seed and 84 to 112 lb. superphosphate), wild oats will be found to cause very little trouble. It has been found that where the subsurface soil is firmly compacted the wheat crop (which demands a firmly compacted seed-bed) has a great advantage over black oats. Oats prefer a looser seed-bed to attain their best and



A Successful Wheat-grower's Home.
Mr J Gagie, West Wyalong

most rapid development and cannot compete so successfully with wheat if the conditions are made to favour the latter. The use of the roller on fallows early in the fallowing period to break up the clods which harbour black oats is also of great assistance in the eradication of this plant, particularly on heavy soils.

Oaten Chaff for Horses.

During the last few years flag smut has been spreading at an alarming rate, and at the present time it is hard to find a wheat crop entirely free from this disease. It has been found that a prolific source of infection is the feeding of chaff made from wheaten hay infected with flag smut.

Many farmers, realising the losses caused by this disease, make vigorous efforts to rid an infected paddock. They burn the stubble early, grow a crop of oats, then bare-fallow the land. By this means the flag-smut spores

in the soil are starved out. Unfortunately, in most cases the treatment ends here and the land is reinfected by horses which have been fed on flag-smutty wheaten chaff. The process of passing through the stomach and intestines of the horse does not destroy the flag smut spore, a point which, unfortunately is not generally realised by farmers. Where it is known insufficient attention is paid to the fact.

In districts in which flag smut is prevalent farmers would be well advised always to feed their horses on oaten chaff, as oats are not generally affected with flag smut. Some farmers object to using oaten chaff on account of the risk of spreading black oats, but if a paddock is dirty with black oats, wheaten hay cut from the paddock will contain as many wild oats as will oaten hay. The idea—still held by a few—that cultivated varieties of oats rapidly degenerate into black oats is erroneous.

A Successful Wheat-grower's Home.
Mr R. H. Thackeray, Young

Most farmers now sow an early maturing variety of wheat on their headlands and divisions to be afterwards cut for hay. Many are going a step farther and are sowing an early maturing variety of oats such as Mulga or Sunrise for this purpose. This is a practice that can be definitely recommended.

There is no sound objection to the feeding of oaten chaff, while the growing of oats provides a welcome change for the land from continuous wheat culture. Adoption of this practice would tend appreciably to reduce the annual losses from flag smut.

Fungus Diseases.

As the various fungus diseases of wheat have been described by departmental officers and control methods outlined, it is proposed merely to stress practical preventive methods.

It may be taken as a very definite rule that wheat stubble should always be burnt and never ploughed in. If this practice of burning the stubble is invariably adopted and if in addition a crop of oats is grown on the land as often as possible a decided step will have been taken towards preventing the spread of such fungus diseases as flag smut, take-all, foot-rot, wheat mildew and wheat blight.

It is thought that flag smut, as well as being spread by horses fed on flag-smutty wheaten chaff, may also be spread to a reasonably clean fallow paddock by grazing sheep on wheat stubble and then transferring them to the fallow. Flag smut is now so widespread throughout the district and is causing such heavy losses to wheat growers that farmers cannot afford to overlook any possible source of infection.

Dry Treatment for the Prevention of Bunt.

The dry copper carbonate treatment for the prevention of bunt (stinking smut) in wheat has now completely superseded the old bluestone and formalin treatments. Briefly, the advantages of the dry copper carbonate method are :—

1. It is a more effective method of preventing bunt.
2. There is no chance of reinfection of the treated seed.
3. It does not depress the germination.
4. The early growth of the young wheat plant is healthier and more vigorous.
5. The seed can be treated at any time (not necessarily immediately before sowing) without having any harmful effect on the germination.
6. The treated seed may safely be sown in a dry seed-bed if necessary.
7. Higher yields are invariably obtained when the dry process is adopted.

The treatment consists of dusting the copper carbonate (which is a very fine powder) over the seed so that each grain of wheat receives a thin coating. This is generally done by the use of a revolving drum. There are numerous makes of these machines on the market. In making a choice care should be taken to see that the machine is of such a design that the seed is thoroughly dusted; also that it is reasonably dust-proof, so that the operator suffers no inconvenience due to the inhalation of this irritating powder.

At the present time it is considered that 2 oz. of the powder per bushel of wheat is necessary to ensure thorough dusting. The dry copper carbonate method can be confidently recommended as being superior in every respect to both the bluestone and formalin treatments.

Wimmera Rye Grass.

Wimmera rye grass has been utilised by Victorian wheat farmers for some considerable time. It was introdued to New South Wales a few years ago, but has not yet been very widely grown. Where it has been sown, however, very satisfactory results have been obtained. It is drought resistant and is very palatable to sheep, cattle, and horses. It considerably increases

the carrying capacity of the land. From two to three sheep per acre can be maintained on Wimmera rye grass pasture in all but the driest districts. Many Victorian farmers depend on it for their working horses.

The grass is an annual, but re-seeds itself each year with such certainty that it is perennial in effect, and once sown in a paddock is always present. The only disadvantage of the grass is that once established it is always present on the farm, and unless the fallows are kept in order by heavy stocking with sheep and are cultivated prior to sowing the wheat crop, the grass will grow in competition with the crop and the yield will be somewhat reduced. It can, however, be stated that under ordinary farming conditions as they exist in the southern district this would never happen, except on the most neglected farm. The grass is so palatable that if sheep are grazed on the fallows they will eat it so closely that hardly any seed will be produced; consequently there will be very few young rye grass plants growing in the

A Wheat-grower's Comfortable Home in the Coolamon District.

wheat crop and certainly not sufficient to reduce the wheat yield. It has been found that if sheep are heavily grazed on the fallows there is no necessity even for special additional cultivations of the fallow on account of the Wimmera rye grass. This has been the experience at Yerong Creek, where the rainfall is fairly heavy and reliable for a wheat district, and where the grass would be more likely to get out of hand than it would in a drier district.

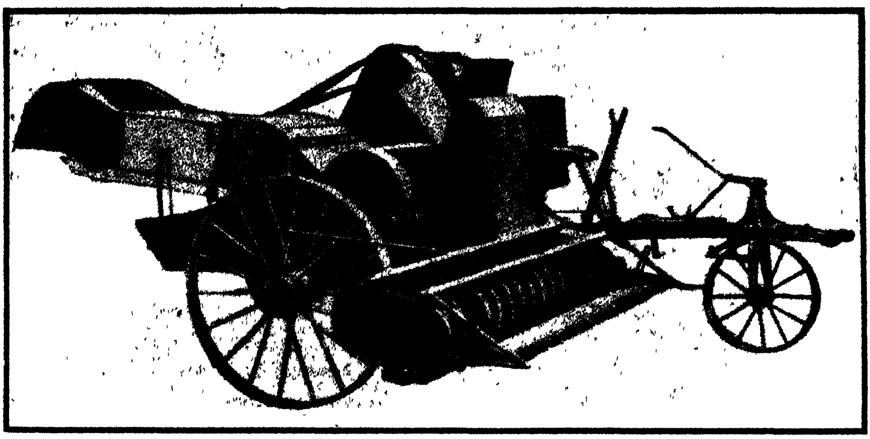
Wimmera rye grass is valuable to the wheat and sheep farmer who wishes to carry as many sheep as possible without reducing his wheat yields. In the hands of a careless wheat farmer it is perhaps of doubtful advantage.

The seed can be sown at the rate of 2 to 3 lb. per acre (mixed with the superphosphate) when sowing wheat. The grass grows up with the wheat crop and seeds before the wheat is harvested. The old plants die in the middle of summer and the seed which becomes scattered on the ground germinates with the first rains in February or March, and gives an early growth of green feed on the stubble that can be grazed from that time onward. Even when the grass is dry in summer it is quite palatable. The most

opportune time to establish the grass is when a paddock is to be left out for grazing for a few years. If the grass seed is sown with the last wheat crop an excellent pasture will be produced after the crop is harvested.

Tractors.

During the last few years tractors have been used on many wheat farms, but there is a great difference of opinion among farmers as to their efficiency, also as to their effect on the cost of production. While tractors are certainly capable, under certain conditions of working longer hours and at a faster speed than horses, they do not cheapen the cost of production in the field. Figures recently collected by the United States Department of Agriculture illustrate the position at the present time in the great winter wheat belt of the United States. These figures show that for every field operation



A Modern Wheat Harvesting Machine.

The problem of harvesting of wheat in Australia has been solved by the highly ingenious and economical machinery of which the above is an example, the heads being reaped, and the grain threshed and bagged at the same time.

connected with wheat growing, including ploughing, cultivating, drilling, and harvesting with both reaper and binder and harvester, the horse is slightly cheaper than the tractor. These statistics also show that tractors are only used to a limited extent in wheat growing and have not supplanted the draught horse to anything like the extent that might have been expected.

The results of a three days' economic conference of wheat growers recently held in Oregon (U.S.A.) is also most interesting in this connection. This conference, which five hundred delegates attended, was looked upon as one of the most important meetings of wheat growers held in the last decade. The production committee in its recommendations to the general conference stated that:—"Under average conditions wheat farms having less than 1,000 acres of cultivated land per farm produced wheat at less cost per acre, and per bushel, with horses than with tractors, and hence found horse power operation more profitable than tractor power operation." They also found

that under average conditions wheat farms having more than 1,000 acres in cultivation produce wheat as cheaply, in many cases at lower cost per acre and per bushel, with tractor operation (combined with horses), than with horses alone." They indicated that "even on large farms horse operation is efficient, and need not necessarily be converted to tractor operation." Another conclusion was that "horse-drawn combines harvest wheat at less cost than tractor-drawn combines."

The initial cost of the tractor and the cost of the fuel is much greater in Australia than in the United States, also the price of horse feed is cheaper here than in America. These facts are all in favour of the horse for Australia. Although tractors may possess some features that make them desirable under certain conditions, they have this disadvantage of increasing the cost of production, and as farmers are growing wheat primarily for profit it is a most serious disadvantage, and until tractors are capable of performing field work at a lower cost than horses they cannot be recommended for the small wheat farmer. Even the farmer who is growing wheat on a large scale would find it more profitable to depend chiefly on horses for his power. He may, however, find it very convenient and possibly economical (if he is working on a sufficiently large scale to warrant the expenditure) to keep a powerful tractor to be used only at rush periods, such as harvesting, to supplement his horse teams.

Infectious Diseases Reported in December.

The following outbreaks of the more important infectious diseases were reported during the month of December, 1926:—

Anthrax	5
Pleuro-pneumonia contagiosa	6
Piroplasmosis (tick fever)	Nil.
Blackleg	2
Swine fever	Nil.

—Max Henry, Chief Veterinary Surgeon.

Points in Irrigating Lucerne.

Good grading will help to secure a proper distribution of irrigation water, and the development of even crops.

Lucerne must have sufficient moisture if full yields are to be obtained.

The soil should not be allowed to dry out between irrigations.

If lucerne is checked for want of water, subsequent irrigation will not renew the growth—fresh shoots will develop.

The appearance of the plants is the best guide as to when to irrigate. The lucerne should have a light green colour.

Keep the lucerne growing without check through dryness.

—L. C. Bartels, Senior Irrigation Officer, Victoria.

Field Experiments With Wheat.

TRANGIE EXPERIMENT FARM, 1926.

F. MATTHEWS, Experimentalist.

TRIALS to ascertain the varieties of wheat most suited for grain production in the Trangie and surrounding district were continued this year, with slight differences as to time of sowing. It being decided that the sowing of crops later than 31st May is too late in most years for successful results, the early sowing now takes place about mid-April, and the mid-season sowing about mid-May, no sowing being made later than this.

The soil on which the experiment was situated is typical of large areas in the surrounding district, *i.e.*, a red sandy loam of uniform texture, with no defined subsoil, and with a distinct tendency to form a hard surface crust after rain. The block had been sown with oats for silage in 1924. It was sundercut 3½ inches deep on 9th September, 1925, again 3 inches deep on 6th October and on 12th January, 1926, springtoothed 2½ inches deep on 29th March and springtoothed before the drill in the case of the early sown trial, and on 13th April and again prior to drilling in the case of the mid-season trial.

The plots were sown in triplicate in areas of one-thirtieth of an acre, on 17th April at the rate of 49 lb. of graded seed per acre for the early sown and on 14th May at the rate of 66 lb. of graded seed per acre for mid-season sowing, the seed in all cases being dusted with dry copper carbonate at the rate of 2 oz. per bushel. Ordinary or low-grade superphosphate was applied at the uniform rate of 78 lb. per acre in both cases.

The seed bed was in good condition at time of sowing, being free from weeds, having about 2 inches of surface mulch, and the consolidated mass below well charged with moisture. Germination in both cases was only fair (about 75 per cent.), due mainly to the abnormally wet conditions prevailing at seeding time. The early-sown plots were cross-harrowed on 18th May, and fed off at the rate of twenty sheep per acre for three days at the end of June. The mid-season plots were lightly eaten back on 31st June, 1926, and harrowed afterwards.

The rainfall on the fallows was 13·43 inches on the early-sown area, and 15·33 inches on the mid-season sown. On the growing crop the rainfall was 7·18 inches and 5·28 inches respectively. The bulk of the rain benefiting the growing crop fell before the end of August, though opportune showers totalling 114 points towards the latter end of September materially assisted the crops, which at the time were mainly in the flowering stage. There being very little rain after feeding off, the plots did not make a very bulky

growth, the average height not being greater than 2 ft. 3 in. The flag, however, remained green right on to the dough stage, and the straw was very fine and solid. The fact that oats are included in the rotation was doubtless the main factor in the control of flag smut and foot-rot, from which diseases the plots were remarkably free.

It is seldom that crops in this district ripen under such favourable conditions as prevailed this year. Mild days and cool nights enabled the crop to ripen naturally and evenly, and the resulting grain, though somewhat small, was remarkably plump and heavy.

Harvesting was carried out on 6th November, 1926, for the early-sown section, and on 13th November, 1926, for the mid-season trial.

Results of the Early-sown Trial.

The following are the average results of the triplicate plots in the early-sown trial:—

Varieties.	Average of Triplicate Plots. bus.	lb.	Varieties.	Average of Triplicate Plots. bus.	lb.
Union	38	15	Riverina	33	25
Baroota Wonder	37	25	Federation	33	15
Boonoo	36	30	Early Bird	32	0
Waratah	35	25	Hard Federation	31	50
Canberra	35	20	Imp. Steinwedel	29	35
Duri	35	0	Binya	24	40
Wandilla	33	30	Florence	24	35

Union (Federation x Cowra 15).—The longest season wheat under trial, maturing about five days later than Federation. It is a short-growing wheat, with a compact erect head; does not shell, and stands the weather well. The grain is small, plump, golden in colour, and fairly hard. In this district should only be sown up to mid-April.

Baroota Wonder (South Australian selection from Ward's Prolific).—Introduced as a hay wheat, this variety has yielded well in both years of trial. It is white chaffed, almost free from awn, the grain having a slight tendency to shell. The grain is large and fairly plump. Growing season approximately that of Canberra.

Boonoo (Improved Steinwedel x Yandilla King x Zaff).—A very good stooler; straw fairly strong, but not coarse. Heads are large and well-filled, glabrous, and tip-awned. The grain is small and plump; opaque and inclined to shell.

Waratah (Hudson's Early Purple Straw x Gluyas.)—A very satisfactory wheat for the stripper; showed slight signs of shelling, due doubtless to the fact that no rain was obtained after heading to toughen the chaff. Grain rather slender, but heavy and of good colour.

Duri (Hurst's 14 x Canberra).—Appears to be slightly stronger in the straw than Canberra, and somewhat easier to thrash. Slightly affected with loose smut and septoria.

Results of the Mid-season Trial.

The average of the triplicate plots in the mid-season trial are shown in the following table :—

Varieties.	Average of Triplicate Plots.		Varieties.	Average of Triplicate Plots.	
	bus.	lb.		bus.	lb.
Bobin	37	15	Canberra	33	55
Silver Baart	36	50	Bald Early	33	15
Early Bird	35	30	Federation	33	5
Duri	35	15	Hard Federation	32	30
Riverina	35	3	Waratah	30	10
Bandon	34	50	Binya	29	45
Baroota Wonder	34	35	Florence	23	50
Boonoo	34	0			

Bobin (Thew x Steinwedel).—On trial for first time this year. Stools well, has good straw; head brown, tip-awned and well filled; is easy to thrash, does not appear to shell, and ripens three days later than Canberra.

Silver Baart (from South Africa).—A white chaffed variety which is very tough to thrash, and stands up well; about the same growing season as Gresley. The grain is large, well filled, and translucent, and is somewhat similar in appearance to a very good sample of Firbank.

Early Bird (Federation x Volga Barley).—The earliest wheat under trial. Yielded a very fine sample of grain, but would have been most difficult to harvest had wet weather been experienced, as the straw is weak; shelled slightly.

Riverina (Federation x Volga Barley).—Yielded well in both trials, and is reputed to be resistant to foot-rot. Its main objection here is the length of time which elapses between ears peeping and ripening stages, which renders it liable to frosting.

Bandon (selection from Yandilla King).—Heads later than Canberra, but ripens about the same time; has a somewhat open head, with big, plump, translucent grain; would be better suited to earlier sowing.

Bald Early (Victorian selection from Imp. Steinwedel).—This variety should be sown in the early section in preference to the mid-season, as a stud bulk sown earlier yielded at the rate of 41 bushels per acre. It is a good stooler, grows about a foot short of Steinwedel, and does not shell. Its season is, if anything, a day or two longer than that of Steinwedel.

Farmers' Experiment Plots.

POTATO TRIALS, 1925–26.

Central Western District.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

THE area sown annually with potatoes in the Central Tableland district of the State is approximately 7,500 acres. The chief centres of production are Orange (3,000 acres), Millthorpe (1,600 acres), Carcoar (1,100 acres), Bathurst (900 acres), and Oberon (920 acres). The average yield in this section for the last ten years is approximately 2·5 tons per acre, the last two seasons being particularly adverse, with light rainfall and early frosts.

Field experiments were conducted last season with the following farmers:—

Wm. Burns, Carcoar.
J. C. Ironmonger, Huntley, via Orange.
E. A. de Latour, Springside, via Orange.
G. W. Kelly, Oberon.
T. Britt, Borenore.
R. C. Whalan, Tarana.
W. R. Beddie, Shaw, via Blayney.
D. E. Mitchell, Hartley.

The season was not a favourable one. Heavy rains in November, the main sowing month, were responsible for the crop going in under bad conditions, and by setting the soil in early sown crops they adversely affected germination and growth. The months of December, January, and February were very dry, and the growth of haulms was small and the setting of tubers very light. From mid-March heavy and continuous rain was experienced practically through the winter, completely destroying the crop on low-lying ground and delaying the digging in many instances almost until spring. The already light yield was therefore reduced by rotting in the ground, while scab (slightly more prevalent than in recent years) and potato moth (prior to the mid-March rain) also took their tolls.

The rainfall for five months at centres representative of the localities where the experiments were conducted was as follows:—

Month.	Carcoar and Shaw	Oberon	Tarana.	Borenore.	Huntley and Springside.
1925.	points.	points.	points.	points.	points.
November ..	638	......	......	261	......
December ..	71	....	77	91	102
1926.					
January	67	240	155	226	215
February ...	25	14	104	52	58
March	523	843	531	771	776
April	......	600	434	......	642
May	......	462	... ..	......	......
Total ...	13 24	21·59	13·01	14·01	17·93

Comparable results were not obtained at Hartley. The yields at the other centres are shown in the following tables :—

YIELDS of Variety Trials.

Variety.	Huntley.				Springside.				Carcoar.				Oberon.				Tarana.				Shaw				Borenore.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Improved Brownell's Beauty.	4	18	1	14	4	10	0	0		...				...				...			2	15	2	0		...		
Batlow Redsnooth.	4	1	2	9	1	0	1	0	1	1	2	0	2	0	2	24	2	2	1	20	2	7	0	0	2	1	1	0
Factor ...	3	19	0	0	2	8	0	0	1	7	3	0	2	8	1	0	3	15	1	20	4	18	0	0	2	16	0	0
Early Manhattan.	3	18	3	0		...			2	9	1	0		...			3	1	1	4	2	7	2	0	4	16	1	
Symington ...	3	15	0	0	2	9	0	0	2	12	1	0					2	2	1	20	3	12	0	0				
Late Manhattan	3	16	2	17	3	10	0	0		...								...								...		
Elliott's Pink Eye.	3	10	0	0	1	10	0	0	1	13	1	0	2	13	2	8	5	3	2	14	2	17	2	0		...		
Langworthy ..		...			3	8	0	0	1	9	1	0	2	7	0	16		...			3	11	1	0	3	8	1	
Dakota Red	3	3	1	2	1	1	0	0	1	9	0	0	1	8	0	0		...				...			4	2	2	
Gold Coin	3	17	0	0		...				...			2	0	0	0		...				...				...		
Early Rose		...								...			1	14	1	4	2	4	3	4		...				...		
Satisfaction						...				...				...			2	17	2	0		...				...		

YIELDS of Fertiliser Trials.

Fertiliser per Acre.	Huntley (var. Factor).				Springside (var. Late Manhattan).				Oberon (var Early Rose)			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
No manure	4	3	0	0	2	19	0	0	1	5	3	0
*P1, 322 lb.	4	8	0	0	3	0	0	0	1	11	1	0
P2, 322 lb.	4	10	3	0	2	4	0	0	1	12	0	16
P3, 408 lb.	4	13	0	11	2	7	0	0	1	10	0	0
P7, 322 lb	3	17	3	0	2	6	0	0	1	9	0	0
P10, 364 lb.	4	7	0	16	1	18	0	0	1	16	2	0
M3, 364 lb	3	16	0	0	1	18	0	0	1	13	1	0
M13, 364 lb.	4	3	1	10	3	1	0	0	1	7	0	0
Superphosphate, 280 lb. .	3	16	2	0	3	11	0	0	1	14	1	4
Blood and bone, 280 lb. ..		...			4	3	0	0		....		

* P1 mixture consists of 10 parts superphosphate and 1½ parts sulphate of ammonia; P2 of 10 parts superphosphate and 1½ parts sulphate of potash; P3 of 10 parts superphosphate, 3 parts sulphate of ammonia and 3 parts sulphate of potash; P10 of 10 parts superphosphate, 1½ parts sulphate of ammonia, and 1½ parts sulphate of potash; M3 of 10 parts superphosphate and 3 parts sulphate of ammonia; M13 of 10 parts superphosphate and 3 parts sulphate of potash; P7 of equal parts superphosphate and bonedust.

Details of Plots.

Carcoar.—A variety trial was sown on 28th and 29th October in rows 2 ft. 9 in. apart, 2 cwt. superphosphate per acre being applied in the drills at time of planting. The site of the experiment was new ground of a grey colour and medium-poor quality. It was mouldboard ploughed early in September, springtoothed early October. and harrowed prior to sowing. Very heavy rain after sowing caused very poor germination of Redsnooth,

which, owing to the large size of the tubers, had to be sown with cut sets. The growth of tops was small and the yields light. Symington gave the highest yield, and has always given good results at this centre. Early Manhattan, the main variety in the locality, was slightly inferior to Symington.

An experiment to determine the effect of several fungicides for the control of scab was conducted also, and will be continued until conclusive data is obtained.

Springside.—Variety and manurial trials were sown on 26th November and harvested 26th August. The land (a fertile red basalt) had previously been under peas, and was in excellent tilth at sowing time. Blood and bone at the rate of 1 cwt. per acre was put on with the drill prior to planting. Dakota Red, Redsnooth, and Improved Brownell's Beauty were sown with cut seed. The two former germinated very badly, their yields in consequence not being comparable with those of the other varieties. The growth of tops, although not luxuriant, was very good considering the drought conditions which prevailed during summer. The ultimate yields were also very good, although the proportion of small unmarketable potatoes was large. Improved Brownell's Beauty, which gave a gross return of 6 tons 16 cwt., had 27·2 per cent. unmarketable and Late Manhattan 25·5 per cent., and the other varieties showed even a greater percentage.

The trial of fertiliser mixtures was made with Late Manhattan dusted in the drills. The results were in favour of blood and bone at 280 lb. per acre, followed by superphosphate at the same rate. The mixtures containing sulphate of potash and sulphate of ammonia in varying proportions with superphosphate did not yield so well as the simple fertilisers, and only two were superior to the unmanured section. Blood and bone gave an increased return of 1 ton 4 cwt. per acre over the unmanured plot, the proportion of small tubers being very considerable in the latter. The drought conditions prevailing in the summer would prevent the whole of the fertiliser becoming available to the plant, and would account for the increase in yield over the unmanured plot being negligible.

Huntley.—The experiments in this locality were a variety trial (sown 5th December) and a fertiliser trial (sown 16th and 17th December) as at Springside; 1 cwt. superphosphate was applied on the drill at sowing time in the variety trial. The soil was a red basaltic loam of excellent quality, the site being practically new ground, two crops only having been grown previously, the last one swede turnips (unmanured). Following the harvesting of the turnips, which was a light crop, the ground was mouldboard ploughed and harrowed, springtoothed in early November, and again prior to planting. The harrows were used after sowing, and just after the plants were through. The yields were very good in view of the poor season, Improved Brownell's Beauty occupying first place, followed by Redsnooth and Factor.

The fertiliser mixtures gave better results here, although the highest return over the unmanured section was only 10 cwt. per acre. The highest

yields were obtained with fertiliser mixtures containing superphosphate, sulphate of potash, and sulphate of ammonia. Factor was the variety employed for this trial. In both trials the percentage of small tubers was high, while a good deal of second growth was noticeable.

Tarana.—Variety trial sown 23rd and 24th November on a well-prepared site, which had been out of cultivation for many years; superphosphate sown at the rate of 2 cwt. per acre. The germination of Redsnooth and Symington was faulty. The growth of top was excellent, and the crop made rapid growth in the early stages. Dry conditions and hot winds during February considerably lowered the prospective yield. The development of scab throughout this crop was excessive, and materially affected the yield and quality of the tubers. Elliott's Pink Eye gave the highest yield, and was well in advance of the other varieties.

Borenore.—The variety trial sown here on 19th November was situated on a low-lying piece of land, with the result that four out of the nine varieties rotted in the ground. These varieties were flooded during the heavy autumn rainfalls, 19½ inches being recorded for the three months of March, April, and May. In preparation for sowing the ground had been mouldboard ploughed and harrowed in early September, springtoothed and re-ploughed prior to sowing; 3 cwt. of superphosphate was sown with the wheat drill prior to planting. Early Manhattan gave the highest return, with Dakota Red second.

Shaw.—A trial of seven varieties, sown 16th November on ground which had been cropped two years previously with oats. Ploughed in August and springtoothed just before drilling; the soil, a red loam, was in fair condition at sowing. Germination was not uniform, and was best in Factor, Langworthy, and Symington. The growth of haulms was very good considering the light rainfall, and the yield of the three varieties mentioned was under the circumstances very satisfactory. The Factor and Symington were both of excellent quality. Both these varieties gave good yields the previous season in similar trials in the Neville district, which adjoins Shaw.

Oberon.—Variety and fertiliser trials, planted 23rd December on land previously cropped with peas. The land was ploughed and harrowed in September and springtoothed in November, and at sowing time was moist and in good condition; superphosphate at the rate of 2½ cwt. per acre was sown with the varieties. The season was particularly adverse in this locality. February was very dry, and the dry weather continued until the middle of March, when in less than a fortnight nearly 8½ inches of rain fell. Digging here was very much delayed, and the tubers rotted in the ground. The heaviest yield was obtained from Elliott's Pink Eye; the yields of Factor and Langworthy were slightly inferior, but the quality of the potatoes was better. Elliott's Pink Eye gave the heaviest yield in the previous season's experiments also, and appears to be suited to the locality.

The manurial trial was sown with Early Rose, a variety much grown in the district, but one which has never occupied a prominent place in variety trials. The most satisfactory yield was from P10, which gave good results in 1923, but very little better yields than the no manure plot in 1924. M3, the fertiliser which came next highest, has also given inconsistent returns. P2 gave the highest returns during the two previous seasons, and, yielding only 4½ cwt. less than P10 this season, can be considered the most consistent. In the last three seasons it has given an average increase of 10 cwt. per acre over the unmanured section.

Comments.

The season being so unfavourable, it is not possible to draw fair comparisons between varieties or fertiliser mixtures. The old standard varieties in most cases were better than the newer ones, and of the latter Symington and Elliott's Pink Eye were the most successful. A variety which yields well, and is of excellent quality and deserves to be widely cultivated, is Factor.

While the comparative failure of the potato crop in the Central Tablelands during the last two seasons can be put down to lack of rainfall, it is very evident that improved methods of cultivation would result in far better yields. The first ploughing for potatoes should be given much earlier than is the custom, and more frequent springtooth cultivations and harrowings should be adopted to conserve moisture and control weed growth. As peas usually form portion of the farm revenue where potatoes are grown, every effort should be made to systematically rotate these two crops, the influence of the former on the latter being particularly noticeable. Where peas are not grown regularly, an effort should be made to introduce a legume into the farm rotation at least every third year to add humus and replenish the supply of nitrogen.

Growing from seed that is free from disease, of medium size, and which has been selected from the highest yielding plants at digging time is strongly recommended.

What Herd Testing Does.

Some little time ago, a cow was awarded several prizes as best dairy cow at a show in a well-known dairying centre. She was under test at the time, and although well tried out for several years in competent hands, she was found to be one of the worst producers on the farm, and was eventually killed for beef.

Quite recently I was told by a recognised good judge of dairy cattle that he had purchased no less than 130 cows (mostly the best to be got at clearing sales) in five years. This number was culled to fifty, which were entered in a herd-test association. After the first year's test, 20 per cent. of them were found to be unsatisfactory producers.—W. J. Yuill, Senior Dairy Supervisor, Victoria.

A Better Farming Train.

THE Premier has announced the Government's intention to inaugurate a "Better Farming Train" in New South Wales, with a view to encouraging improved farming methods and greater production. In referring to the proposal, Mr. Lang stated that he fully realises the need for more adequate provision to keep our primary producers up to date in all the latest farming methods and innovations, and on scientific facts in regard to fertilisers, breeding, labour-saving appliances, &c. When the train has been equipped it will visit the farming districts, and experts in all branches of agriculture will advise on cultural methods, disease and pest control, packing and preparation for market, the care and management of stock, and other subjects in which the farmer is directly interested. Old methods in agriculture, the Premier points out, must give way to new methods, otherwise production becomes limited to a protected local market, our products being unable to compete in foreign countries where the more scientifically produced goods of our rivals can undersell us. Profitable production is not merely a matter of wages and hours; it is a question of concentration, organisation, and up-to-date methods.

The work of organising and equipping the train is already in hand, and it should soon be ready to begin a useful career. If it receives the encouragement which the Premier expects in the various districts, it is the Government's intention to make the Better Farming Train a permanent part of the State's instructional system.

Commenting on the proposal, the Minister for Agriculture (Mr. Dunn) said: "In dealing with this project, many difficulties have had to be faced. The great area over which our agricultural and pastoral industries extend, and the distances that will have to be travelled by the train when equipped, made it a matter for serious consideration as to whether an effort of this kind in our State is practicable.

"I am gratified that the difficulties have been overcome, and that the Better Farming Train will be an accomplished fact in the near future.

"The main objective of the train will be to bring the rural communities more directly into touch with the Departments which exist for their welfare. The resources of Departments such as Agriculture, Health, Education, and the Rural Bank have not in the past been fully availed of, for the proper development of the State and the improvement of country conditions, and a feeling has grown up in the minds of our farmers and settlers that they are denied opportunities and assistance which are readily at the disposal of city folk.

"The Better Farming Train will do much to develop a healthy spirit of co-operation between the country districts and more closely populated areas. It will be staffed by experts in all branches of agriculture and stock-raising. Such a train has already been established in Victoria, and has carried out a number of tours, the results being eminently satisfactory.

"Full details of the composition of the Better Farming Train will be announced within the next few weeks. The Department of Agriculture and the Railway Commissioners have the arrangements in hand.

"The Better Farming Train will be a travelling college, and should prove a boon to farmers and graziers, particularly new settlers, by helping them to obtain a better return for their labour and better living conditions."

Tubercle-free Herds.

Of the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner.	Address.	Breed.	Number tested.	Expiry date of this certification.
Department of Education	Yanco Agricultural High School.	......	29	14 Jan., 1927.
Walter Burke	Bellefaire Stud Farm, Appin	Jersey..	36	19 March, 1927.
Department of Education ...	Gosford Farm Homes	......	32	16 April, 1927.
H. W. Burton Bradley ...	Sherwood Farm, Moorland.	Jersey..	71	21 May, 1927.
William Thompson Masonic Schools.	Baulkham Hills ..	....	33	15 June, 1927.
Department of Education ...	Mittagong Farm Homes.	......	33	7 July, 1927.
Hygienic Dairy Company ...	Glenfield Farm, Casula, Liverpool.	.....	113	15 Sept., 1927.
Lunacy Department ...	Morisset Mental Hospital.	......	14	18 Oct., 1927.
Department of Education ...	May Villa Homes ...	......	6	3 Nov., 1927
Do do ..	Eastwood Home	......	10	3 Nov., 1927.
Do do ...	Hurlstone Agricultural High School.	......	47	4 Nov., 1927.
Lunacy Department ...	Rydalmere Mental Hospital.	......	61	23 Nov., 1927.
A. E. Collins	Hazelhurst Dairy, Bowral.	......	10	6 Dec., 1927.
Miss Brennan	Arrankamp, Bowral	......	27	7 Dec., 1927.
Lunacy Department ...	Callan Park Mental Hospital.	......	26	15 Dec., 1927.

—Max Henry, Chief Veterinary Surgeon.

Inland Dairying.

A Neglected Factor to Success.

E. O. DALGLEISH, H.D.D., Senior Dairy Instructor.

To obtain maximum returns from a dairy cow it is essential that she have access to supplies of green and succulent fodder, especially during the early months of lactation, when naturally the yield is highest. This fact is ignored by a great many farmers engaged in dairying in inland districts, and as a result it is safe to say that collectively these farmers lose many thousands of pounds each year.

The successful farmer is he who studies the seasonal conditions of his district and endeavours to turn them to his own profit. In coastal districts dairy farmers as a general rule arrange for their herds to come into work in the spring months of September and October, in anticipation of the new growth of pastures which usually occurs in those months. For the inland dairy farmer to follow a similar procedure is to invite low returns. Almost invariably October is the month in which his pastures dry off, for the pastures consist only of plants which are annuals—that is, they grow, seed, and die within a year, and the advent of hot weather is the time for them to set seed and die off. This refers more particularly to the warmer western slopes and plain country than to the tablelands, where winter conditions are too severe for any growth of pastures, and dairying (as on the coast) must be largely confined to the summer.

It is rare indeed for the warmer inland parts to be favoured with sufficient rain during the summer months to promote any appreciable growth of green feed. The storms and occasional heavy falls fail to yield any growth unless backed up by further falls almost every week. Stock, therefore, usually subsist on the dry growth from the previous winter, and the farmer from the coast who visits inland parts in the summer might be excused for considering it a parched and droughty land. Conversely, however, the farmer from inland districts who visits the coast in winter would wonder where the much vaunted dairying pastures were.

Almost every year there is in inland districts a growth of green pasture during the autumn, winter, and early spring, that of the past winter being an unusually good example. The dairy farmer should make every endeavour to take advantage of this, and to get all his cows in by the beginning o August at the latest, thus obtaining the benefit of higher prices (during the coastal slack period), coupled with better quality due to the cooler weather, and higher yields as the result of more favourable pasturage. It can be said that the inland pastures are at least two to three months earlier than

those of the coast, and it seems inexplicable that so many farmers do not get their cows into their yards before December or January—a time when conditions all round are most unfavourable.

There are, of course, exceptions to every rule, and there will be years when the inland farmer who gets his cows in during the months of July and August will find himself without feed. Those years, however, are rare, and can be guarded against by fodder conservation—an easy matter in most districts. The present disastrous spring in coastal parts is an example of expected pasture failing to materialise.

The old fallacy that inland country is unsuitable for dairying is rapidly disappearing. With water conservation at the head waters of the rivers, dairying on the river flats has many advantages, and on rivers such as the Lachlan, water conservation would, as on the Murrumbidgee, lead to an enormous expansion in dairying. This inland expansion is already making itself felt, and must continue if New South Wales is to continue to produce enough butter to supply its own local trade. Such expansion to be of permanent value must, however, be directed along lines most profitable to the farmer.

Is President Plum Self-sterile?

In the *Agricultural Gazette* for July, 1926 (p. 552), Mr. S. A. Thornell, Orchard Inspector at Young, pointed out the failure of President plums to set their fruit in the Young district, when planted in positions isolated from other varieties of plums, whereas it is found they crop satisfactorily when planted close to Robe de Sergeant prune trees.

Tests have been carried out for some years past in the orchard at Yanco Experiment Farm in the cross-pollination of the Robe de Sergeant prune, which in many districts has been found to be at any rate partially self-sterile. These tests have shown that President plum is interfertile with Robe de Sergeant, but no tests have been carried out to ascertain whether President plum requires cross-pollination, as it is generally noted for its heavy cropping. In fact in many districts this plum sets too heavily and, unless thinned, the fruit does not attain sufficient size to realise good prices. Some growers in the Orange district actually propose to work over adjacent plum trees of other varieties with President, in order to prevent cross-pollination in the hope of lighter crops and larger fruit. Mr. Thornell's observations should be of special interest to those contemplating such action, for if President plum is self-sterile in their districts, as it appears to be in the Young district, the crops after the working over will be far too light.

Until a grower is satisfied from observations made in his locality for not less than four or five consecutive years that President will crop sufficiently without cross-pollination, he should allow adjacent trees of other plum varieties to remain, and rely on thinning of the fruit of President as soon as final shedding is complete to maintain the desired size of fruit.—W. le Gay Brereton, Assistant Fruit Expert.

Cream Flavours.

THEIR IMPORTANCE AND CONTROL.

C. J. MACDERMOTT, H.D.D., Senior Dairy Instructor.

THE economic aspect of cream flavours and their control has been pointed out in this journal, and also in other publications, from time to time, but the present stage of development of the dairying industry calls for more thought on this question than heretofore.

Quality in dairy produce is receiving the closest attention from buyers, and the general consumer, too, is becoming more discriminate in this regard. It is pleasing to note the advance that has been made in this respect, and great credit is due to the dairy-farmer and the factory organisation for the part they have played in making this possible. There is still ground to be covered and more improvement to be made in a portion of our dairy produce, and it is in connection with this small percentage that the question is discussed.

The dairy produce factory largely depends on the quality of the produce supplied to it for the quality of the article produced. Modern machinery for the treatment of milk and cream has helped considerably in this respect of late years, but nothing yet has been devised that will enable a really inferior cream to be made nto a hgh-grade butter.

The Cost to the Farmer.

Anything which interferes with the returns to the farmer is of the utmost importance for obvious reasons, particularly at the present stage of development of the industry, and the supplying of inferior cream has a very direct influence on the size of the cheque. For this reason alone the subject requires careful consideration, apart from other aspects.

Each year sees a reduction in the amount of inferior cream delivered to factories, and the further reduction of this amount to the absolute minimum should be possible during the next few years of development.

A good deal of thought and attention has been given to the question of stabilising the markets for dairy produce during the last year or two, and in spite of certain opposition the first effort has been successfully launched. Without discussing this scheme in any way, it certainly has helped to maintain a return to farmers on a higher level during the year. Thus all dairymen are benefitting by the better marketing conditions, but unfortunately a few are losing that benefit by occasionally supplying inferior cream and receiving an inferior price therefor.

Remedy in the Hands of the Supplier.

The question of reducing the quantity of inferior cream delivered is one which has occupied a good deal of attention from many quarters in the past, but the remedy really lies in the hands of the individual farmer concerned,

The cause of the inferior quality may be pointed out and the methods necessary to overcome it explained (as is often done), but the carrying out of such suggestions is in the hands of the man himself.

There is always a cause of inferior quality in cream—sometimes easy to find, at other times more obscure, but in few cases is it impossible to discover the reason for it. Contrary to the belief of some, the factory grader does not class cream as "second quality" if it can possibly be avoided.

Dairymen may rest assured that the cream-grader at the factory is able to differentiate between good and bad cream, and that when a can of cream is graded second quality it has a taint of some description which warrants the classification. The trouble may be looked for at some point between the cow and the factory, and in most instances it is not very difficult to trace.

Very often "second quality" cream is supplied simply because the fundamental principles governing the development of flavours in cream are not understood.

Development of Flavours in Cream.

It is proposed briefly to discuss the common causes of inferior quality in cream, with the object of bringing about a better understanding of the principles underlying the question.

It is first of all necessary to understand that if the milk could be kept in the same condition as when drawn from the udder of the cow, no deterioration in quality, from a practical point of view, would occur, provided the milk was drawn from a healthy cow. Therefore, the development of flavours in milk or cream (except food flavours) is due to some form of contamination between the time the milk is drawn until the cream is delivered to the factory.

To assist in understanding cream flavours, they may be divided into three main classes, viz.:—

1. Food flavours.
2. Absorbed flavours.
3. Bacterial flavours.

Food Flavours.

Food flavours are present in the milk when drawn from the cow, and, as the term implies, are due to certain foods eaten by the cow. Most of these food flavours are volatile, and can be eliminated or greatly reduced by pasteurisation and aeration at the factory, while aeration over the ordinary farm cooler also assists in this respect.

Such weeds as carrot weed, cape weed, dandelion and certain others are strong milk tainters at certain stages of their growth, and the ordinary treatment at the factory may not remove taints of this nature. In such instances, the cream is graded second quality.

Generally speaking, light food taints are not of much consequence, and rarely necessitate the cream being graded second quality. They constitute a class of flavour over which the farmer has not much control. Where-

pastures contain strong tainting seeds, efforts should be made to keep the cows off such pastures for at least three hours before milking, if possible, while the cream should be aerated over the ordinary farm cooler as it leaves the separator.

Absorbed Flavours.

This term is applied to flavours absorbed by the milk (or cream) after being drawn from the cow. Unfortunately, butter-fat has the power of readily absorbing flavours with which it comes in contact, either in dairy utensils or the atmosphere. Such flavours are usually very difficult to remove and are, therefore, important from a butter quality point of view.

Probably the commonest flavours of this kind met with are the exhaust fumes from oil engines situated near the bails or separator room and the flavour absorbed from teat ointment, or from disinfectant sometimes used in or around the dairy premises. The fat in milk or cream readily takes up such flavours, which reduce its value from a commercial point of view.

Where the exhaust fumes are tainting the cream it may be either from a leaky manifold in the engine room or from the fumes being blown back through the bails or dairy. Where this occurs, it is advisable to carry the exhaust higher, so that the fumes will be carried sufficiently far away by the wind. If the peculiarity of butter-fat in absorbing odours is borne in mind, ordinary care will prevent the recurrence of such flavours.

Other kinds of absorbed flavours are occasionally met with, such as the smell from an unclean separator, milk vat, or a dirty piggery. The obvious remedy is prevention, which in most instances is not difficult.

Bacterial Flavours.

The bacterial flavours are easily the most important, and are the cause of 99 per cent. of the inferior cream delivered to factories. These flavours are brought about by the growth of bacteria (sometimes called germs or microbes) in the milk or cream. As they grow and multiply they decompose certain constituents of the milk or cream, and by so doing cause certain flavours therein. In doing so, they are merely carrying out their natural functions, and much the same result is obtained when any animal matter is decomposed.

It is not intended to discuss bacteria or their functions to any extent, but simply to mention one or two facts concerning their action on dairy produce and the methods of controlling them, which every farmer should understand.

It is interesting to note that they are the smallest type of vegetable life known to science, and are only visible with the aid of a high-power microscope. Bacteria are essential for man's existence, and play a most important part in the cycle of nature. They have certain functions to perform, and it is when they get beyond these, or into places where they naturally should

not be, that the trouble commences. Broadly speaking, they abound everywhere, and part of the dairyman's business is to prevent as many as possible gaining entrance to the milk or cream supply. This may be done by careful attention to certain details in the bails and dairy.

While there are numerous varieties of bacteria found in nature, only one type is desirable from a cream flavour point of view, and then only in small numbers. This is the type which is responsible for the development of lactic acid in cream, which, when present in the correct amount, enhances the value of the product. All other types are undesirable, and bring about flavours which may cause the cream to be graded second quality.

To properly understand the question, it is necessary to know just how bacteria gain entrance to the milk or cream and how their growth may be retarded or controlled. It is not possible, under practical conditions, to prevent bacteria gaining access to the milk or cream supply, but the amount of contamination and the subsequent growth can be controlled by the methods employed and the conditions under which the dairying operations are carried out. The quality of the cream depends largely on the attention given to these details.

As previously remarked, bacteria are very widely distributed and abound in dust, mud, dung, stagnant water, and all unclean matter of any nature whatsoever. The atmosphere also contains large numbers, the immediate surroundings being the deciding factor in this respect. They gain access to the milk during milking at the following points:—

(*a*) From dust or mud on the cow's teats.

(*b*) From dust and hairs falling into the bucket from the body of the cow, or through the swish of the cow's tail.

(*c*) From improperly cleaned buckets or cans.

(*d*) From the hands of the milker.

(*e*) From the atmosphere, especially if dust is prevalent.

(*f*) From allowing the teat cups of milking machines to come in contact with the floor of the bails while the machine is in action.

Common-sense precautions can be taken, without interfering with the ordinary routine work, which will reduce contamination from the above sources to a minimum.

In addition, it is also advisable to *discard the first stream of milk from each teat*, as in some instances the teat canal may carry large numbers of bacteria, which are removed with the first stream of milk.

Further contamination may (and usually does in the case of second grade cream) occur from improperly cleaned dairy utensils, such as milk strainers, vats and faucets, separator parts, milk or cream cans, &c. Where there is the slightest trace of old milk, slime, or fat (grease) on the separator parts or other utensils, bacteria exist in countless millions and are carried along with the milk or cream as it passes through.

Generally speaking, contamination from these sources is much heavier than that experienced while the milk is being drawn from the cow, and the importance of this aspect of the question is therefore apparent. This is particularly so with inferior cream.

Cleaning Separator Parts and other Dairy Utensils.

The cleaning of dairy utensils, if somewhat irksome, is not particularly difficult. From the point of view of cream quality, it is one of the most important operations on the farm, yet sometimes it does not receive the attention it warrants. This is due largely to the fact that the bacteriological aspect is not properly understood. Owing to our climate conditions, which are so suitable for bacterial growth, improperly washed dairy utensils result in a large amount of contamination of the cream supply, with a likelihood of inferior cream. The object of cleaning dairy utensils and separator parts is not only to remove the milk or cream adhering thereto, but also to kill all bacterial growth thereon. The removing of the residue of milk or cream is not difficult, and is best done with the aid of proper brushes and warm water to which a small amount of washing soda has been added. It is important that all particles of milk or cream should be removed. Rags should not be used in the wash-up.

The next procedure is to kill the bacteria adhering to the utensils. There are two common methods of killing bacteria—one is by the use of germicides or disinfectants, and the other is by the use of heat in the form of boiling water or steam. Disinfectants cannot be safely used for treating dairy utensils except in special cases, and the boiling water treatment is the general method adopted. This is very effective when properly carried out.

The Use of Boiling Water.

The question of an effective boiling water supply on the farm has been rendered more difficult of late years on highly improved properties by reason of the shortage of wood. This has not yet reached an acute stage generally, and where it has steps can be taken to overcome it. Older dairying countries have had the same problem to face and have adopted modern water heaters—electric heaters (where cheap power has been available) and other methods. We have hardly reached that stage, but consideration might be given on certain farms to the installation of bricked-in coppers (where not already done) as an economical means of heating water and for cleansing dairy utensils. The ordinary chip bath heater is a convenient method of using up cobs, waste paper, &c., but care must be exercised to see that the water is heated sufficiently. To effectively treat the utensils, the water must be close to boiling point. Warm water is of very little value, and water which has been heated some distance from the dairy and is left to stand at the wash-up bench for five or ten minutes after being removed from the fire quickly cools off to well below boiling point.

The most effective method is to place the separator parts and the smaller dairy utensils, after properly washing, in the vessel used for heating water (be it a copper, kerosene tin, or whatever is used), while still on the fire,

making sure that the water comes to the boil. After five minutes, remove utensils and hang up or stand in a clean atmosphere. They will dry thoroughly in a few minutes without resource to rags, and will be in perfect condition for the next milking. Set-in coppers are very useful for this purpose, and are not only economical as to the wood supply, but are effective in wet weather.

It is safe to say that the small percentage of inferior cream now delivered to factories would be almost eliminated if the above methods of treating dairy utensils were carried out and attention given to a few other details. By far the greater portion of this small amount of inferior cream is brought about by the utensils not being properly cared for.

It is, of course, necessary to treat the utensils as outlined *twice daily, i.e., after each milking.* Where the milking has been carried out in such a way so as to reduce bacterial contamination to a minimum, and where the separator parts and other utensils have been correctly treated as suggested, other things being equal, the cream coming from the separator will be in a sound condition from a bacteriological point of view and will not be heavily contaminated. This being so, there is every likelihood of it remaining in a "choice" condition until it is delivered to the factory. Additional precautions may be taken to assure of this being done.

Additional Precautions.

The object now is to limit the growth of the bacteria present in the cream after separating. As previously stated, even though every precaution has been taken up to this point, the cream will still contain a certain number of an undesirable type of bacteria, but where the seeding is small, it is not difficult to maintain the cream in choice condition. Unfortunately for the dairying industry, bacteria make their maximum growth at the temperature at which the milk comes from the cow. As the temperature is reduced, so the development of bacteria is reduced also, until a stage is reached where the temperature is too low for their growth. Hence, butter after manufacture is stored in specially constructed insulated rooms where a low temperature is maintained, which prevents bacterial action, and so preserves the quality of the produce. The same thing applies to meat and other foods. All this is done to prevent bacterial action, and we begin to realise the important part this minute form of life plays in our existence.

On the farm, it is not possible to reduce the temperature of the cream to a point where bacterial growth ceases, but by slightly reducing the temperature to the lowest point possible under the conditions operating, the growth can be checked or lessened and the quality of the cream further preserved in this way. By the sensible use of the small farm cooler the temperature of the cream may be reduced by 15 or 20 degrees, depending on the temperature of the water being used, and although this will not prevent bacterial action, it will certainly retard the growth of the most undesirable types, which, with attention to other details, will ensure the delivery of a sound "choicest" cream.

The following points should be remembered:—

(*a*) Most bacteria are killed by high temperatures, hence the necessity of steeping the dairy utensils, including all separator parts, in boiling water for five minutes, *twice daily*. This should be done after the utensils have been thoroughly washed.

(*b*) Their growth is retarded by low temperature, so that where the cooling of the cream can be carried out, better quality is maintained.

(*c*) The ordinary summer temperatures and conditions are so favourable to bacterial growth that additional precautions are necessary to maintain quality.

There are other points which have a bearing on cream quality, and some of them and their influence will be discussed.

The Butter-fat Test of Cream.

The test of the cream has an indirect effect on quality in some instances, and for this reason it is always desirable to run the cream at the proper thickness. For the summer months the test should be between 40 and 42 per cent., while during the colder months it may be reduced to 36 to 38 per cent. A thin cream—that is, a low testing cream, never has the same keeping quality in hot weather, owing to the increased amount of separated milk present and a greater bacterial action. This should be attended to, as the adjustment of the cream screw is only the matter of a moment.

The Mixing of Warm and Cold Creams.

The mixing of warm, freshly separated cream with a cold, ripe cream from a previous separation is very often accompanied with disastrous results as regards quality. It is a bad practice for several reasons, one being that the temperature of the bulk of the cream is thereby increased, resulting in increased bacterial activity. Again, if the older cream is very acid and thinly separated, the casein will most likely be precipitated in the form of white specks, which everyone is acquainted with as ordinary curdled cream, or again a "junkety" condition may be brought out. All these defects may result in the cream being graded second quality. Fortunately, this practice is fast disappearing, but it sometimes occurs where cream is forwarded daily to the factory. The cream lorry comes soon after the morning separation, and in order to get both separations away the creams are mixed while the morning separation is still warm. "Junkety" cream often occurs where this is done, and to obviate it the morning cream should be cooled before mixing. If a cooler is not available for this purpose, by standing the can in a tub of water and stirring the cream briskly for ten minutes the temperature can be reduced slightly.

Daily Stirring of Cream.

Stirring of cream two or three times daily helps to maintain the cream in good physical condition and to liberate any gas which may form. If the cream is left standing for hours before stirring there is a tendency for the

heavy portion (casein, &c.) to gradually settle towards the bottom and for the fat to rise to the top, especially if the cream is inclined to be thinly separated. This is not desirable, and stirring will prevent it. A tinned steel or tinned copper stirrer should be used: on no account should a wooden stirrer be employed for this purpose.

Milk from Cows Advanced in their Milking Period.

It is quite well known that milk from newly calved cows will cause trouble when included in the general supply before it becomes normal, but it is not so generally recognised that some cows when advanced in their milking period will secrete abnormal milk which will affect the cream and cause it to be graded second quality. This is particularly so when a cow has been milking for a long period, say, twelve months or more, as happens when a cow does not go in calf readily. When this type of cow begins to spring the milk will probably become abnormal, and the cow should be dried off, or the milk fed to the pigs.

Water for Dairy Cows.

Although it is most desirable from many points of view that cows should have a plentiful supply of good clean drinking water, sometimes the water is blamed for second-quality cream, when in reality it has nothing whatever to do with it. Although tainted drinking water can, and does, impart certain flavours to cream, it rarely happens that such flavours cause the cream to be graded second quality. Whatever flavour the water may impart is absorbed from the body of the cow before and during the secretion of the milk, and it does not become worse as the cream is kept, but sometimes gradually disappears. In any case, it can usually be partially or wholly removed by the ordinary treatment at the factory. This class of flavour is not so important for that reason.

Bacterial flavours, for instance, gradually become worse and worse as the cream is kept, but absorbed flavours imparted by water do not. Where cows wade in muddy pools or waterholes, it is the contamination they carry out on their legs, flanks, tails, and udders, which causes trouble later on. This is one of the commonest causes of ropy milk or cream. The bacteria responsible find their way into the bucket during milking and from there into other utensils or separator parts, where they may exist for some considerable time, unless proper precautions are taken. The boiling water treatment will kill the bacteria responsible for ropy cream.

The Transit of Cream.

Dairymen should make sure that their cream is protected from the sun, while awaiting the cream carrier on the roadside. Should the cream waggon not be properly covered so as to protect the cans from the sun's rays, a complaint should be made to the factory manager. Direct sunlight will soon reduce the quality of the cream and efforts should be made to see that there is no likelihood of this happening from the time the cream leaves the dairy until it reaches the factory.

Summary.

Bacterial Flavours.—Most of the inferior cream delivered to factories, which is only a small percentage, is graded "second quality" on account of certain bacterial flavours being present.

Cleanliness.—To prevent bacterial contamination, care and scrupulous cleanliness are essential during all stages of production and treatment on the farm, while all dairy buildings and their surroundings should be kept clean and wholesome.

Use Boiling Water.—The boiling water treatment of all separator parts and other dairy utensils, including coolers and skim milk receptacles, should be carried out *twice daily,* after proper washing. The temperature of the water should be at least 200 degrees Fah.

Cool Milk and Cream.—The use of the ordinary small farm cream cooler will help to preserve the quality of the cream and assist in delivering a choicest article. Its use is strongly recommended.

Daily Deliveries.—Cream should be delivered daily to the factory during the summer months. While in transit, whether in the cream waggon or the farmer's own vehicle, it should be properly protected from the heat of the sun.

Locate Causes of Deterioration.—Should a farmer have a can of cream graded second quality, he should endeavour to locate the cause, and treat all separator parts and other utensils, of any nature whatsoever, as outlined above. Should the trouble still persist, he should communicate with the Under Secretary, Department of Agriculture, and advice will be given that will assist him to locate the source of contamination and restore the cream to "choicest" quality.

The District Dairy Instructor will visit any farmer troubled with inferior quality cream and help to effect a remedy. Past experience shows that over 80 per cent. of the farms on which such instruction has been given have been permanently benefited by an uplift from "second grade" to "choicest" in the quality of the cream and milk sent to the factories. Last year 1,500 such visits of instruction were made.

A Cow Worth Buying.

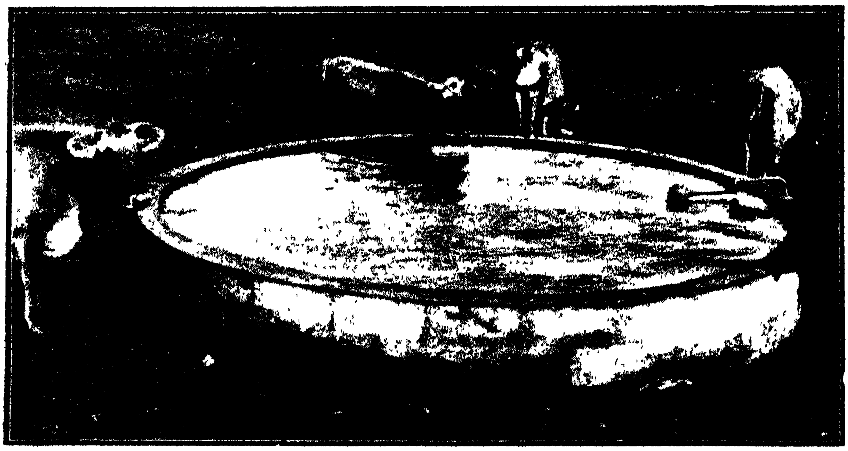
All dairy farmers and cattle breeders admire a typical dairy cow; but it is far more essential that she should be a profitable one. The only sound system of judging is the utilitarian one, viz., by the known record of milk and butter-fat, and keen hard-headed dairy farmers are now appraising values on this basis. At a recent clearing sale of tested grade cows £8 was paid for one with a record of 180 lb. of butter-fat, while £25 was paid for another that had produced 400 lb. under like conditions.—W. J. Yuill, Senior Dairy Supervisor, Victoria.

Concrete Reservoir and Drinking Trough.

I. W. SCOTT, H.D.D., Assistant Dairy Instructor.

THE water reservoir and drinking trough illustrated marks a very progressive move on the part of some farmers on the North Coast, being indicative of a commendable desire to study the interests of the stock (and consequently of themselves) by supplying an ample supply of pure water that is easily accessible. The example could well be followed by many dairymen, who know to their cost the detrimental effect of poor water on milk production and cream quality.

The reservoir, which is built 18 inches out of the ground, is 14 feet in diameter, having when full a depth of water of 2 feet 4 inches, the capacity being about 2,200 gallons, sufficient to water a herd of eighty cows comfortably. At one farm on a hot summer's day seventy cows that had been running in an old cultivation paddock all day reduced the level of the water



Concrete Water Reservoir and Drinking Trough.

11 inches. The bottom consists of 6 inches of concrete smoothly finished off. The walls are built of patented moulded concrete blocks, 6 inches thick, and situated at the bottom is an outlet for cleaning purposes. An overflow pipe is provided at the top, while the inflow of water is regulated by a ball cock in a convenient spot.

On the farm at which the illustration was taken the trough is filled from a 1,000-gallon storage tank (an iron tank a few feet above the level of the trough), which in turn is filled per medium of a windmill.

A plentiful supply of pure water is essential if cows are to produce large quantities of milk and maintain health and condition. Running water and troughs are preferable to dams, &c., for this purpose, and concrete troughing

appears to be the best and most economical method of handling the water supply. In the case of the reservoir or trough illustrated, there is ample room for thirty cows (if need be) to drink at one time; consequently there is less danger of fighting or horning, and of cows getting tipped or pushed into the trough, and they can more easily get away from each other on account of its circular shape.

One man has been using this type of reservoir and watering trough for two years, and in that time only one cow has tried to walk in. The water keeps extremely cool; during the summer the top 2 inches may get hot, but stock soon learn to dip down or stir up the surface to get the cool water beneath.

With 2,200 gallons of water and a drinking length of 44 feet, the herd can be watered with a minimum of disturbance and time. There is ample water to meet several days' requirements should the wind fail; that is, if wind is the motive power for pumping.

Such troughs seem to need less frequent cleaning than do wooden troughs, are economical in the space they occupy, and, where the nature of the farm permits, could be used as a storage reservoir from which to reticulate water to other parts of the farm.

There is without a doubt distinct need for better watering facilities for stock, and though initially the cost of a reservoir of this type (£35) may appear a big expense to many dairymen, the price is reasonable when consideration is given to the beneficial effects both on milk and cream quality, as well as on the stock, accruing from an ample pure water supply made so easily accessible.

How They Judge "Good" Cows.

While many say that type is a certain guide, others assert that a good dairy cow can be known by the colour or the "feel" of the milk, or by the yellow pigment in the skin. Some will swear by the cow with a large udder, the cow with a long thin tail, or maybe one with a good escutcheon. Only recently I was told of a farmer who could tell a good milker from the way she chewed the cud!

Long thin tails and short thick ones are found on good and bad producers alike. The best dairy cow of the world, Melba XV of Darbalara, had a tail which, together with the switch, did not reach to her hocks. The colouring matter in milk is a principle called carotin, and is not butter-fat. Milk may be rich in colour but low in butter-fat content, and milk that lacks the rich colouring may be rich in butter-fat. Large udders may contain a preponderance of muscle tissue; milk-secreting tissue is the essential factor in a heavy milking cow. Escutcheons are a doubtful guide.—W. J. Yuill, Senior Dairy Supervisor, Victoria.

"Insects of Australia and New Zealand."

Under this title Dr. R. J. Tillyard, formerly Linnean Macleay Fellow in Zoology at Sydney University, and now of the Cawthron Institute, Nelson, New Zealand, presents an exhaustive treatment of the insect life of these countries. The indefatigable labours of Dr. Tillyard in the sphere of entomology have earned him a reputation that goes far beyond this part of the world, and interest inevitably attaches to a work from his pen, inasmuch it must include the results of many of his own researches. His devotion, for instance, to the study of fossil forms cannot fail to be invaluable in classification, and in indicating the relationships between the singularly incomplete fauna of New Zealand and the more representative and extensive insect life of Australia. In no way does the work come short of the expectations one thus unconsciously forms in association with the name of the distinguished author, and it is impossible to speak in terms of other than appreciation for the clear and systematic way in which an immense mass of material has been presented. As a text-book it must be regarded as of the greatest value.

In approaching such a task as Dr. Tillyard had set himself it is inevitable that there should be limitations. Space itself imposes some, but an effort to combine text-book and handbook imposes others. Disregarding this, however, we find the essence of the book (chapters V to XXVIII, pages 46 to 467) consists of a study of the various orders of insects, the characters of each order, a brief account of their life history in general, their classificat on, together with excellent keys to the superfamilies and families, a record of the species occurring in each country, and the economic significance of some species referred to.

As might be expected in such a comprehensive volume, a few errors have crept in. Thus on page 241, the dicky rice weevil (*Maleuterpes phytolymus*) is referred to as a root pest of apples in Australia, whereas it is a pest of the foliage and young fruit of citrus trees. Again, on page 372 the Mediterranean fruit fly (*Ceratitis capitata*) is referred to as especially a pest of oranges; as a matter of fact the loss of oranges by this pest in Australia is very small (less than 1 per cent.), but the fly is a more serious pest of late stone fruits. We note too, that the scale *Cryptes baccatus* is figured among the Australian coccid galls in plate 14.

The line drawings by various artists, including many by the author himself, are particularly clear and useful, and the manner in which the wing venation and other essential features are indicated and explained adds much to their value. Washes, coloured plates, and photographs supplement the copious line drawings. One feels, however, that while the illustrations of adult insect features are numerous, a larger number of figures of the immature stages, eggs, larvae, and pupae, together with more descriptive matter in the letterpress, would have been welcome.

The few reservations we have made do not diminish our estimation of the utility of a notable contribution to Australian entomological literature.

Our copy from the publishers, Angus and Robertson, Sydney.

For a useful work on the curing of all classes of skins, write to the Department for Farmers' Bulletin No. 58, "Hides, Skins, and Sundries," enclosing 10d.

The Coastwise Shipment of Cheese.

ADVANTAGES OF BULK CRATES.

A. B. SHELTON, Assistant Dairy Instructor.

CONSIDERABLE loss in quality and condition is caused to Cheddar cheese when it is shipped loose for transport by coastal steamer from ports of manufacture to the city market. The practice is still common with small factories, and in fact it is only during the last few years that many of the larger factories have realised the necessity of providing some means of saving cheese from damage and sweating in transit.

Most of the coastal boats plying between the southern and northern dairy ports and Sydney are of small tonnage and have no facilities for storage of cheese in special chambers, such space being reserved for butter (a more perishable article), and the cheese, if loose or crated, is often stacked in any space available below or on deck without any other protection from damage or contamination than tarpaulins.

The carriage from the factory to the wharf and from the wharf to the wholesale house is controlled by those directly interested in maintaining the quality of cheese, but the weak link is the transport by sea and the loading on and off the boats. Thus the bulk crate, which is made practically airtight and of thick timber, solves the problem.

The procedure in shipping per bulk crate is to cart the cheese to the wharf in covered waggons and there to pack it in the crate, and screw the lid down, after which it is slung by the ship's gear to a suitable place on deck and covered with tarpaulins. On arrival at Sydney it is transferred to the wharf, unpacked by the agents and the cheeses carted to market. Experience has proved that cheese does not sweat or suffer damage under these conditions to any appreciable extent, providing care is taken in the carting and the distance is not too great.

The following particulars are of a crate much in use, which is suitable for either loaf cheese of 14 lb. weight or for large cheese of 40 lb. weight:—Length, 4 feet. 4 in.; width, 2 ft. 2 in.; depth, 2 ft. 6 in. Such a crate is made from rough oregon boards, 1½ in. x 10 in. Hardwood aries, 4 in. x 4 in., are nailed into the four corners, and a hardwood strap, 2 in. x 3 in., is fastened across the bottom of the case, 1 foot from each end of the case. Two iron straps of 2 in. x ½ in. material are then screwed on, extending around the two sides and the bottom of the case, the two ends projecting above the top of the sides, being screwed with ¾ in. thread.

The lid of the crate is constructed of 1½ in. x 10 in. boards, strapped with 3 in. x 3 in. oregon straps on the top side, the straps carrying iron bands 2 in. x 1½ in., having ends projecting, and drilled with 1 inch holes to slip on the threaded ends of the bands on the case, allowing of the fastening on of the lid by ¾ inch nuts.

This case is constructed for factories at a cost of £8, and holds eighteen tiers of four cheeses of 14 lb. loaf size, or six tiers of four cheeses of 40 lb. large size, making its carrying capacity seventy-two loaf cheeses of a total net weight of 1,008 lb., or twenty-four large cheeses of total nett weight of 960 lb. Full cases of this size are freighted to Sydney from South Coast ports at a charge of approximately 25s., and returned empty at a charge of 4s. 3d., making a cost per lb. of cheese of less than four-tenths of a penny.

The writer has used similarly constructed cases for over five years at a very small cost for repairs (principally for new nuts and repairing ends of iron bands), so that the wear and tear is not great, due to the fact that the cases are constructed to allow the ship's slings to be passed under loaded cases without them having to be moved by hand. With a view to making the lids safer and reducing the cost of replacing nuts, cases are now made with the iron bands on lids hinged to the side bands, thus eliminating half the locking nuts.

The capital cost of these cases is very small, considering the saving in damage to the cheeses. Even at a cost of £10 per case, if each case was used for one trip per fortnight, in a period of two years £10 would amount to 3s. 10½d. a trip—an amount which is easily lost by damage to one cheese per trip if the cheeses are shipped loose.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1927.

Society and Secretary.		Date.
Alstonville (N. A. Ogilvie)	Feb.	23, 24
Uralla (D. G. Evans)	,,	23, 24
Oberon (F. B. Packer)	,,	24, 25
Gunning (G. E. Ardill)	,,	24, 25 26
Cessnock (D. B. McGilvray)	,,	24, 25, 26
Robertson (H. T. Carrick)	,,	25, 26
Blacktown (J McMurtrie)	,,	25, 26
Bega ( )	March	2, 3
Tumut ( )	,,	2, 3
Braidwood (R. L. Irwin)	,,	2, 3
West Maitland (M. A. Brown)	,,	2 to 5
Adaminaby (P. L. Crisp)	,,	3, 4
Wauchope (T. Suters)	,,	3, 4
Mudgee (J. H. Shaw)	,,	3, 4, 5
Moss Vale (W. Holt)	,,	3, 4, 5
Penrith (C. H. Fulton)	,,	4, 5
Yass (E. A. Hickey)	,,	8, 9
Glen Innes (G. A. Priest)	,,	8, 9, 10
Bangalow (W. H. Reading)	,,	9, 10
Taree (R. Plummer)	,,	9, 10, 11
Luddenham (J. McKnight)	,,	11, 12
Granville (B. Hyslop)	,,	11, 12
Macksville (W. G. Hughes)	,,	15, 16
Batlow (C. S. Gregory)	,,	15, 16
Armidale (A. McArthur)	,,	15 to 18
Cumnock (K. J. Abernethy)	,,	16
Nimbin (S. H. Kilmister	,,	16, 17
Eden (H. P. Wellings)	,,	16, 17
Gundagai (N. W. Holman)	,,	16, 17
Mendooran (F. R. Mason)	,,	18
Campbelltown (W. N. Rudd)	,,	18, 19
Queanbeyan (A. O. Manns)	,,	18, 19
Blayney (J. H. Moore)	,,	22, 23
Molong (W. P. Stanger)	,,	22, 23
Coraki (J. Allison)	,,	23, 24
Kempsey (N W. Cameron)	,,	23, 24, 25
Tilba (R. L. Hapgood)	,,	25, 26
Quirindi (G. Curtis)	March	29, 30, 31
Orange (G L. Williams)	,,	29, 30, 31
Camden (G. V. Sidman)	,,	31, Apl. 1, 2
Goulburn (F. D. Hay)	,,	31, Apl. 1, 2
Muswellbrook (R. C. Sawkins)	April	6, 7, 8
Sydney Royal (G. C. Somerville)	,,	11 to 20
Liverpool (R. C. Fitzpatrick)	,,	22, 23
Dorrigo (J. H. Skeoch)	,,	27, 28
Bathurst (N. B. Richardson)		27, 28 29
Forster (W. Poppenhagen)	,,	29, 30
Wellington (A. E. Rotton)	May	3, 4
Wingham (D. Stewart)	,,	4, 5
Grafton (L. C. Lawson)	,,	4 5, 6, 7
Windsor (H. S. Johnston)	,,	5, 6, 7
*Dungog (W. H. Green)	,,	11, 12, 13
Coonamble (J. C. Wilson)	,,	18, 19
Casino (P. W.W. Manson)	,,	25, 26, 27
Bonalbo (W. G. E. Johnston)	June	8, 9
Illabo	Aug.	17
Wagga Wagga (F. H. Croaker)	,,	23, 24, 25
Cootamundra	,,	30, 31
Grenfell	,,	30, 31
Lake Cargelligo	,,	31
Young	Sept.	6, 7, 8
Ungarie	,,	7
Ganmain (C. C. Henderson)	,,	13, 14
West Wyalong	,,	13, 14
Cowra	,,	13, 14
Albury (A. G. Young)	,,	13, 14, 15
Murrumburrah	,,	20, 21
Canowindra	,,	20, 21
Temora	,,	20, 21, 22
Boorowa	,,	22, 23
Barellan	,,	28
Barmedman	,,	28
Hillston	,,	30

Farmers' Experiment Plots.

TRIALS WITH GREEN PEAS.

Metropolitan District.

J. DOUGLASS, H.D.A., Agricultural Instructor.

THE following farmers co-operated with the Department in conducting pea experiments during 1926 :—

A. McBurney, Baulkham Hills.
G. Townsend, Penrith.
E. and H. Wilson, Bonnyrigg, via Liverpool.
F. A. Hayes, Kurrajong.

The growing period for the winter and early spring pea crops was in most localities a favourable one. The very early planted crops, however, experienced the heavy rains of March, April and May, which did considerable damage, and in some cases destroyed the plants. Good yields were obtained in most districts, but the excellent supply of all types of vegetables brought the prices of peas down to a very low level. With the advent of dry weather and the falling-off of supplies of winter vegetables, the prices during early October started to rise.

Manurial trials were conducted on all the farms mentioned, Messrs. E. and H. Wilson conducting a variety trial also.

Details of the Plots.

Bonnyrigg.—The district is favourably situated for pea growing, being elevated, and in certain parts practically frost free. The soil in the locality of Bonnyrigg varies considerably, but generally speaking is an open loam of shale origin, poor in fertility, and deficient in organic matter. Many of the growers are on the city water supply, and irrigate when necessary. The experiments were planted under good conditions on 16th March. Germination and early growth were good, but the continual wet weather during the autumn destroyed the value of the plots.

Baulkham Hills.—The soil of this locality is a loam, rather deficient in organic matter, and contains a fair amount of broken ironstone. The land on which the experiment was conducted had previously been cropped with maize. The residue of the maize crop was ploughed under during December, 1925. The fallow was well worked during the summer, and reploughed on 8th April, and planting was carried out on 3rd May in drills 30 inches apart, at the rate of 1 bushel per acre. The germination was excellent and the early growth good. The P1 and P10 plots (containing nitrogen) were outstanding in the early stages of growth, and the P1 plot was prominent right through the growing period, and produced the second heaviest yield. Basic superphosphate produced an outstanding yield, but the results of this

trial are not to be taken as conclusive. Growers in the district have great faith in blood and bone, which, unfortunately, was not included in the experiment. This year Mr. McBurney used blood and bone, with marked success. Superphosphate does not improve the yield to any extent, owing to the presence of ironstone. The presence of lime in basic superphosphate counteracts the influence of the ironstone, with a marked improvement in the crop yield. The peas were pulled on 18th September.

Penrith.—Large areas are sown to peas in this district each year. The soil in most pea-growing localities is second-class alluvial loam, and is most suitable for the growing of this crop. The land on which the experiment was conducted had been fallowed since November, and was in ideal condition at planting time. Planting was carried out on 18th June under good conditions. An excellent germination was obtained. It was very noticeable that the unmanured plot was very backward right throughout the growing period. P1, a mixture containing nitrogen, made outstanding growth right from the early stages, and produced the heaviest yield. The addition of potash by the mixtures P2 and P10 reduced the yield and cannot be recommended. P7, a mixture of equal parts of bonedust and superphosphate, showed up well, and in a more favourable season should give better results. This experiment suffered through want of rain in the late stages ot growth.

YIELDS in Fertiliser Trials.

Fertiliser per acre.	Kurrajong.		Baulkham Hills.		Penrith.	
	bus.	lb.	bus.	lb.	bus.	lb.
No manure	164	24	102	14	68	16
Gypsum, 336 lb.	149	8	113	4	......	
Basic superphosphate, 384 lb.	188	16	166	16	94	8
Superphosphate, 336 lb.	208	6	108	13	91	12
*P1, 386 lb.	188	16	150	22	100	0
P2, 386 lb.	172	24	121	10	74	8
P10, 437 lb.	188	16	129	4	91	12
P7, 302 lb.	164	24	130	19	98	16
Blood and bone, 336 lb.	172	24	......		......	

* P1 mixture consists of 10 parts superphosphate and 1½ parts sulphate of ammonia; P2 of 10 parts superphosphate and 1½ parts sulphate of potash; P7 of equal parts superphosphate and bone-dust; and P10 of 10 parts superphosphate, 1½ parts sulphate of ammonia, and 1½ parts sulphate of potash.

TO GET THE MOST FROM FERTILISERS.

IN order to get the most out of fertilisers it is necessary to study the soil, the crop, and the characteristics of the fertilisers. The best results can only be secured from fertilisers when all the factors affecting plant growth are properly taken care of. This means that the drainage and the physical condition of the soil must be properly cultivated, a good rotation must be practised, good seed must be used, and injury from diseases and insects must be prevented as far as possible.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Wheat—

Bena	E. J. Johnson, Iona, Wongalea. W. W. Watson, Woodbine, Tichborne. J. Lyne, Downsfield, Yenda. W. Ash, Old Grenfell Road, Forbes.
Binya	Manager, Experiment Farm, Condobolin.
Canberra	Manager, Experiment Farm, Condobolin. Manager, Experiment Farm, Trangie. W. G. Law, Wattle Park, Armatree. W. W. Watson, Woodbine, Tichborne. Quirk and Everett, Narrawa, Wellington. T. Jones, Birdwood, Forbes. E. J. Johnson, Iona, Wongalea. E. J. Allen, Gregra.
Clarendon	Manager, Experiment Farm, Coonamble. E. J. Johnson, Iona, Wongalea.
Currawa	W. Cameron, Heather Brae, Loomberah. Quirk and Everett, Narrawa, Wellington.
Federation	Manager, Experiment Farm, Temora. W. G. Law, Wattle Park, Armatree. W. W. Watson, Woodbine, Tichborne. A. Millgate, Rockvale, Parkes. E. J. Johnson, Iona, Wongalea. J. Lyne, Downsfield, Yenda. T. Jones, Birdwood, Forbes.
Firbank	Manager, Experiment Farm, Condobolin. Manager, Experiment Farm, Trangie.
Ghurka	Manager, Experiment Farm, Condobolin.
Gresley...	E. J. Johnson, Iona, Wongaléa. W. W. Watson, Woodbine, Tichborne.
Hard Federation	Manager, Experiment Farm, Temora. Manager, Experiment Farm, Trangie.
Marshall's No. 3	W. G. Law, Wattle Park, Armatree.
Riverina	W. G. Law, Wattle Park, Armatree. Quirk and Everett, Narrawa, Wellington.
Turvey	F. Corke, Wynnefield, *via* Cowra. Quirk and Everett, Narrawa, Wellington
Wandilla	Manager, Experiment Farm, Cowra. W. G. Law, Wattle Park, Armatree. G. R. B. Williams, Gerelgambeth Ltd., Illabo.

Wheat—continued.	
Waratah	Manager, Experiment Farm, Condobolin.
	Manager, Experiment Farm, Trangie.
	W. W. Watson, Woodbine, Tichborne.
	E. J. Allen, Gregra.
	F. Corke, Wynnefield, *via* Cowra.
	Quirk and Everett, Narrawa, Wellington.
	G. R. B. Williams, Gerelgambeth Ltd., Illabo.
Yandilla King...	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Cowra.
	Manager, Wagga Experiment Farm, Bomen.
	W. G. Law, Wattle Park, Armatree.
	A. Millgate, Rockvale, Parkes.
	Quirk and Everett, Narrawa, Wellington.
Zealand	Manager, Wagga Experiment Farm, Bomen.
Oats—	
Algerian	Manager, Experiment Farm, Bathurst.
	C. Bennett, Forbes-road, Cowra
	D. B. Milthorpe, "Somerset," Narandera.
Gidgee	Manager, Experiment Farm, Trangie.
Mulga	E. J. Allen, Gregra.
	C. Bennett, Forbes-road, Cowra.
Barley—	
Trabut	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Cowra.
	J. W. Childs, Camden.
Skinless	Manager, Wagga Experiment Farm, Bomen.
Pryor	Manager, Wagga Experiment Farm, Bomen.
Grasses—	
Sudan Grass	H. K. Nock, Nelungaloo.
	Manager, Experiment Farm, Yanco.
	Manager, Experiment Farm, Cowra.
Millets—	
Japanese Millet	Manager, Experiment Farm, Coonamble.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

"Chemistry for Agricultural Students."

In the application of research to agricultural problems a wide acquaintance with many branches of scientific work is necessary, and the student must be capable of applying his knowledge of scientific methods in one direction to the study of several other spheres of inquiry. This book of 350 pages is designed by the author, Mr. R. H. Adie, lecturer in physics and chemistry at the School of Agriculture, Cambridge, England, to show how even the most fundamental facts and inferences of chemistry and physics have a bearing on the practical side of agriculture. The changes that take place in the processes of the soil and of plant growth are highly complex, and toward these the attention of the student of agricultural chemistry inevitably turns after basic principles have been cleared. This useful little book imparts its information in understandable terms, and will be found helpful in various circles.

Our copy from the publishers, University Tutorial Press Ltd., London.

Drying the Sultana.

R. J. BENTON, Fruit Instructor.

PREPARATIONS for the processing of sultanas must now be made. With the probability of a record crop in Australia this season, which will compel possibly over 85 per cent. of the crop being exported overseas to compete with foreign grown fruits, it behoves every grower to do his utmost towards producing the light golden coloured fruit which the export market demands.

It is essential to success that the quality, particularly in respect to colour and appearance, shall be of a high grade and standardised as far as possible. The colour of a high quality product is dependent chiefly on cultural methods while the fruit is growing and on weather conditions during drying. Whether a hot or cold dip is used does not materially affect the colour if the other conditions are not of the best.

Picking.

Picking should be commenced only when the fruit is quite ripe. If the fruit is over-ripe or barely ripe, a darker finished product results. A pale milky coloured sultana produces the best coloured dried fruit. Its juice should test from 11 degrees to 14 degrees Baumé, according to the soil and seasonal conditions experienced. If the crop can be conveniently handled and the drying season is not an adverse one, picking may be delayed until a Baumé reading of about 12 degrees to 15 degrees is reached, as this will provide a heavier yield. Unfortunately all bunches of sultanas do not colour uniformly, and if two pickings are not made, two buckets should be used in order that the greenish and best coloured fruit may be kept and treated separately from riper fruit. This method of picking is about 15 per cent. more costly, but the outlay is compensated for by the higher grade of the fruit when dry.

Dipping.

Whether a hot or cold dip should be used is still open to question. A significant feature of recent drying seasons has been the increasing number of growers using the latter method. Both have their advantages. If the prospects favour a bad drying season, dull weather, occasional showers, and little heat, the hot dip is recommended, as the fruit dries more rapidly. But in a suitable season the cold dip produces a better pale golden colour, though the time of drying is increased from 30 to 100 per cent., which means that extra rack space for drying may be necessary.

In using the hot dip a temperature slightly below boiling point is favoured by many, ranging around 200 degrees Fah. Lye at a strength of from 1 lb. caustic soda to 20 gallons of water, or even up to 35 gallons of water, may be used, varying in accordance with the toughness of the skin, the greenish

fruit being more tender than the milky coloured or yellowish. Greater dipping strengths of lye, while hastening the process of drying, induce excessive cracking of the berries, allowing a sugary crystallisation to be formed, which collects dust, and gives the product a sticky finish and a less attractive appearance.

The fruit should not be in the dip for more than a few seconds, and the effect of the immersion should be the formation of minute cracks in the skin. If these cracks are easily noticeable the length of the immersion or the strength of the dip should be reduced. A sweeping motion when immersing the bucket of fruit in the lye results in a slightly more uniform treatment of the grapes. Fruit to finish a good bright even colour should dry quickly, which requires that the fruit shall be spread out not too thickly on the racks. If the weather is dull and cool thin spreading is especially necessary. After two days' use at the most the dip should be renewed, as the accumulated dirt and debris in the water prevent a bright colour being obtained.

After the quota of water is put into the dipping tank and just prior to dipping, the depth of the water in the tank should be marked, and when about 300 buckets of grapes have been immersed water should be added until the mark is again reached; a little caustic soda should also be added to keep up the strength of the bath.

The Cold Dip.

As mentioned previously the cold dip is becoming increasingly popular, and the excellent product that results warrants every grower trying this method on a portion at least of the crop. The dip itself is made of 25 lb. carbonate of potash to 50 gallons of water and 1 pint of olive oil. After the potash is dissolved in the water about a gallon of the solution is used for the thorough emulsification of the oil, which is then added to the potash solution. "Free" oil should not be allowed. It is a good plan to allow the oil emulsion to stand for two minutes before the potash solution is added in order that free oil may be noticed. Free oil in the dip will make greasy fruit and will retard drying.

The object of the cold dip is to remove the bloom on the berries, thus hastening the drying period. Should any bloom remain on any berries they will dry a darker colour. As distinct from the rapid immersion required with the hot dip, a longer dip of two to three minutes is required with the cold dip. The dipping tank will usually hold up to twelve buckets of fruit at a time, hence dipping will not be so tedious as it appears. About 800 to 1,000 buckets a day may be handled in one dipping tank. Mr. A. V. Lyon, of the Viticultural Research Station, estimates that 1 cwt. of carbonate of potash and 3 gallons of olive oil are required to treat 5 tons of dried sultanas. The dip should be renewed every 3,000 to 4,000 buckets.

A Baumé hydrometer is a most useful instrument for occasionally testing the density of the dip. The reading of the dip prior to commencing is about 5 degrees to 6 degrees, and as dipping proceeds an endeavour should be made

to maintain that density by the addition of a fresh emulsion, or if possible, by transferring dipping to a second tank, the solution in which may later be supplemented from the emulsion of the first tank, which will have settled during a period of non-use.

After being dipped the fruit is spread on the racks in the usual manner, care being taken to spread the fruit thinly. A certain amount of inequality of colour will be noticeable on drying.

Drying will take from ten to fourteen days if the weather is favourable, and at intervals of two or three days a weak potash and olive oil spray should be applied at least twice. This spraying solution is made as follows:—Four tablespoonfuls of olive oil are emulsified with just sufficient potash, and then added to 4 gallons of water. This spraying, while not making dark fruit a golden colour, will even up the greenish shade and hasten drying.

Drying racks should be provided with light hessian sides, which should be lowered if necessary to prevent a hot mid-day sun from shining on the berries. Exposure to the sun tends to scorching and browning—especially during the first few days after dipping. Shade drying always produces the brighter coloured fruit, irrespective of the kind of dip employed.

Should the berries, when almost dry, display any trace of dip residue, they should be rubbed through the racks on to hessian and then washed or sprayed with a weak carbonate of potash and olive oil dip of similar strength to that recommended above for spraying. This final spray appears to add greatly to the uniformity of colour which is so desired.

Spreading the fruit on dry hessian for a few hours will complete the drying.

Additional Instructors and Investigators for Agricultural Department.

The Minister of Agriculture (the Hon. W. F. Dunn, M.L.A.) announces that the Government has approved of nine additional appointments being made to the instructional and investigational staffs of his Department.

"The Government", he states, "is fully alive to the necessity of affording every possible assistance to the man on the land, in order to enable him to conduct his farming operations on the most up-to-date and economical lines; and to reduce to the lowest possible minimum the losses arising from the ravages of diseases and pests of stock and crops by the adoption of remedial or control measures which have been evolved as the result of careful investigation and experiment."

These additional appointments will enable further work to be undertaken in the field as well as in the laboratory, the benefit of which will be reaped not only by the farmer but indirectly by the State in general, as the losses resulting from diseases and pests of stock and crops have an important bearing on the economical welfare of the community.

Poultry Notes.

February.

JAMES HADLINGTON, Poultry Expert.

As far as local conditions are concerned, the first month of the new year has brought with it very much improved prospects for the poultry industry. Poultry foods, with the exception of maize, have receded somewhat in price, and egg values have kept up above those ruling this time last year; and since this has followed on higher prices all through the plentiful season, the prospects are certainly brighter, especially so since bountiful rains have favoured the growth of all stock foods, which should ease the demand for mill offal.

The one cloud upon the otherwise clear sky is the unfavourable reports from London with regard to the low prices received for our eggs that have been exported. It will be a mistake for poultry-farmers to attach too much importance to this unfortunate experience in one year's operations. Bad as it is, it is not going to extinguish our export trade. It may to some extent check next year's operations, but even this, if I mistake not, will be but a passing phase, and our exports will continue to grow in proportion to our ability to produce eggs. This, I think, should be patent to all who look at the matter in true perspective.

This will be better appreciated when we realise that our eggs constitute but about 2 per cent. of the eggs imported into Great Britain. If our flush season coincided with that of Europe, then the position would be entirely different. But every poultry-farmer knows that the eggs available for export to great Britain from European countries in winter cannot be great. The fact that eggs make up to 3s. per dozen in winter is proof of this. We have only two serious competitors in the London market during our flush season—Argentina and South Africa—but even these two when combined with our own would not (it is estimated) constitute more than 6 per cent. of the total imports into Great Britain. The idea then that our export trade has been killed is obviously unsound.

Work for February.

The principal work for the month will be the disposal of the balance of the third-year hens as they go off laying, and of the cockerels not required for stud purposes, together with close attention to the pullets that have come on to lay, or that are commencing. How to cull out the non-layers among the older hens was dealt with in the October issue of these Notes. As regards pullets that are coming on to lay, there should be so few to cull (except obviously weedy specimens) that in good average quality stock it will matter little whether they are culled or not. In low-class stock there may be much culling to do, of course, but here again they will only be obviously poor specimens.

There is again a tendency to boost a certain system of measurement-testing, and beginners will do well to be careful about classing pullets as poor layers. During the last revival of these selecting systems, thousands of potentially good laying pullets were marketed as culls because they did not answer to the measurements set out. This was due to misunderstanding, and consequent misapplication, of what was perhaps meant to assist poultrymen in selection. The writer has witnessed the rejection of hundreds of pullets because (according to the system) their pelvic bones were not sufficiently wide apart. The fact was that the birds were not in laying condition, and therefore not likely to answer the measurements sought for.

The essential fact for the novice to remember is (as has been previously explained) that the expansion and contraction of width between the pelvic bones is much in proportion to the development of the oocytes (rudimentary yolk) on the ovacluster at any particular period, and the bones of a pullet that has not commenced to lay or is not closely approaching that point will still be fairly close together. *The distance between the pelvic bones in this case is no criterion whatever of laying qualities.* In other words, the pullet or hen must actually be in full lay before the pelvic bones are any guide to her value as a layer; even then the actual width is not an infallible guide in all cases.

A Test.

If poultry-farmers are in doubt as to the soundness of the above contention, arrangements can be made for any approved person who cares to stake his reputation to give a demonstration on the pullets coming in for the Egg Laying Competition which starts in April next—subject, of course, to the owner's consent to the handling of their respective groups. If it is desired to take advantage of this opportunity, application should be made to the Organising Secretary of the competition, Department of Agriculture, Bridge-street Sydney, so that arrangements can be made for a proper record of the tester's verdicts on each pullet handled. The year's performances of the birds will be the deciding factor as to laying qualities in general.

Management of Pullets.

Apart altogether from the actual inherent laying qualities of pullets, the general management of them is of the utmost importance in respect of the volume of production. A good manager will often secure twice the production from a flock that an indifferent one would. Taking an average flock, management, including feeding, is the main factor in securing results. The poor laying flock more often than not reflects bad management rather than faulty breeding. This assertion might appear in the nature of heresy to those who stake everything on breeding, but it is based on experience and a wide range of observation.

Feeding and housing are the two main factors in management. With regard to feeding, even my advice to feed full and plenty, for instance, is often construed into leaving plenty to lie about the yards. Such a practice

means surfeit, which in turn results in a stagnant state of health and a consequent falling off of production. Only birds up to concert pitch in health are likely to lay well, and feeding has so much to do with this that it becomes a prime factor in production. The feeder should aim at so paying out the feed that the birds will always be just ready for it, and this without, on the one hand, giving them less than they require to maintain body waste, with a surplus for the production of eggs, or, on the other hand, feeding to a surfeit. Appetite will regulate all this providing it is not satiated. Some over-feed, while others do the reverse; both courses lead equally to loss of production.

The moral for the farmer is to take more time over the operation of feeding, so as to be able to gauge the requirements of the birds. It is no use objecting that one has not time to give to this kind of thing. The poultry-farmer who has no time to attend to his birds properly will soon be out of the business in any case, or he will at any rate be among those who call poultry-farming a failure.

These remarks apply equally to all classes of hens, young and old, fat and lean. For the over-fat hen that does not lay eggs in payable quantity there is only one thing—quit her. The farmer cannot afford to starve the flock to deal with a few lazy hens, which in any case probably cannot be starved into becoming producers.

It may be queried, "what about dry mash feeding," in which system there is food always before the birds. The reply is that the dry-mash feeder who fails to supplement his mash, and who relies solely upon the fact of feed being always before the birds, cannot be regarded as a skilled feeder in any case, nor are the best results likely to be obtained in such mechanical feeding. But in any case there is a saving clause in dry-mash feeding, which to some extent prevents surfeiting—the dry mash is not sufficiently palatable to induce over-feeding. As a matter of fact, dry mash feeding with the addition of grain at evening is preferable to unskilled feeding. The skilful feeder on the older method, however, will get the better results.

One thing in particular should be borne in mind in connection with feeding at this time of the year—that is, it is a mistake to change the ration. This does not mean that no variation may take place, but that any material change from food the birds are accustomed to will have the effect of putting them off laying. A change from wet to dry mash or vice versa, or from one grain to another, except by way of proportions, is not advisable, and the worst feature is that if either hens or pullets stop laying at this time of the year it is almost certain to result in a moult. In the case of pullets a couple of months laying may be lost, while with hens probably four months or more will elapse before they start again.

Faulty Housing.

The next item in management is housing. Many a flock of pullets that have come on to lay have been put off again by one hot night, due to the way they have been housed. Many a so-called epidemic of roup has been brought

on in the same way. If these things occurred next day the poultry-farmer would connect up cause and effect, but in many cases the cause is obscured by the time that elapses before the trouble manifests itself, and the farmer is found casting about in every direction but the right one to find the source of his trouble.

The way to prevent these happenings, as far as possible, is to ensure cool housing by ample ventilation. Imagine on a hot night a house say 12 feet to 16 feet deep, perhaps low of roof, with perches near the ground and fairly close together, on which are perched a mass of birds touching one another, or again, perches over dropping boards with the same conditions. Let the farmer visit these hen roosts on a close hot night and put his head over the mass of birds and he will get a lesson he is not likely to forget, or if he does forget it he will in all probability be reminded of it by sickness or by loss of production or both. If he is not attentive to the things indicated he will find himself among those who are seeking remedies for ills that are for the most part preventable.

It is worth while reasserting at this time of the year what has so often been stressed in these notes, that is, that conditions—not the introduction of roup on to the farm—are responsible for these outbreaks of the catarrhal form of roup. The organisms responsible for the condition known as roup are always present wherever poultry are kept, hence the sporadic cases that occur from time to time. But to get a first-class outbreak one has only to create suitable conditions for their development.

It is perhaps worth while to mention that science is not so far able to transmit roup in such a way as to infect the flock. Neither has it been able to create a serum to combat it. The explanation of the Pasteur Institute is that roup is not due to a specific organism, but to a group of organisms of a similar type. However that may be, experience has long ago convinced me that roup is the outcome of conditions favourable to the development of the causitive organism, and that such conditions are sometimes the result of more or less accidental grouping of birds, but more often the result of lack of knowledge of the facts of the case, as set out above.

Red Mite.

A sharp lookout should be kept for the appearance of red mite in poultry houses and prompt measures should be taken for its control as soon as the mite is recognised.

When birds are seen to look anæmic or their combs turn dark, or when, perhaps, there is a general run-down appearance of the whole flock, with a falling off in egg production, red mite may be suspected. The perches should be examined—particularly underneath and under the ends that rest upon cleats—when small red insects will often be found in such numbers as to give them the appearance of a semi-liquid substance falling to the floor. These are the suckers, full of the blood that they have extracted from the hens

during the previous night. In addition to these visible signs of blood-suckers there may be swarms of small grey insects. These are the same parasites, but in a different stage. In this stage they will be found in almost any part of the poultry house nests and, in bad infestations, even up in the rafters of the building. The cast skins and excreta will be present in the form of white masses at the entrance, or about cracks and crevices of the woodwork.

The red mite in the blood-sucking stage can very easily be controlled by painting the perches all round with crude kerosene, known also as kerosene tar and as wood preserving oil. It is, however, important that proprietary brands of wood preserving oil containing arsenic or other poisons should not be used, as the poison may be absorbed by the feet of the birds and trouble will follow. The crude oil as supplied by the oil companies is what is required.

Painting the perches is, however, of little use in combating the grey insects once they are scattered about the poultry house. Only persistent spraying with kerosene emulsion is of any use in combating these.

How to Make Emulsion.

To make kerosene emulsion, bring to boiling point 1 gallon of soft water and dissolve in it 8 ounces of soft soap; remove from the fire and add slowly 1 gallon of kerosene; stir briskly for ten minutes or more until the oil is thoroughly incorporated with the soap water, and appears like thick cream; then add this mixture slowly to 10 gallons of soft water, stirring all the time. Smaller quantities can, of course, be made in the same way.

A good force pump with 6 feet or more of hose and a nozzle, such as is used for spraying fruit trees, is the best for this work. Two, three, or even more sprayings may be necessary to properly clean the houses.

Onion Growing on the Tablelands.

The greatest drawback to the spring sowing of onions in tableland districts is that the crop is not ready to harvest until autumn, at which time it is difficult to dry the onions properly on account of the frequency of dews. Unless proper drying can be effected before storing, the bulbs will not keep, and will begin to shoot almost immediately. With autumn planting, much depends on the soil, as on some types the freezing and thawing in winter may cause the plants to be lifted from the soil. This frequently happens on some of the black soils in New England.

Victoria is the main onion-growing State in the Commonwealth, but supplies do not come forward until fairly late in the season. It is therefore advisable for the present for local growers to raise their crop so as to come on the market before the new season Victorian crop is available in quantity. For autumn planting many of the earlier varieties, such as the Early Globes and Hunter River Early Brown Spanish, can be recommended.

On the tablelands, therefore, the main sowing should be made in April and May, and a smaller sowing only in August.—A. J. Pinn, Special Agricultural Instructor.

Orchard Notes.

February.

W. J. ALLEN and H. BROADFOOT.

The fight against the codlin moth pest must be maintained with energy and skill if satisfactory results are to be achieved. All cases which have been returned to the grower should be immersed in boiling water for at least three minutes. As it is important that the grub should be destroyed before it leaves infested fruit, all such fruit should be boiled or burnt.

During this month fumigation of citrus trees can be carried out, but there are certain conditions to be observed. Since a tree suffering from lack of moisture or poor cultivation may be adversely affected by either spraying or fumigation, these operations should not be applied to trees out of condition. Fumigation, which is the most satisfactory method of controlling the scale pests that adversely affect fruit-trees should not be carried on during the day. Night is the time for fumigation. Spraying should only be carried out on cool days.

Growers who intend to fumigate should remember that guesswork and carelessness may prove disastrous. Each tree should be measured and the dosage required for a tree of that particular size should be used. Growers are advised to obtain and study carefully the leaflet on fumigation, which may be obtained on application to the Under-Secretary of Agriculture, Sydney.

Budding.

Any unsatisfactory trees may still be reworked, provided they are in good condition. No matter what the variety or kind of tree, budding wood should be taken only from proved trees. Each tree has qualities which are capable of being transmitted, and, therefore, buds should be chosen from trees whose qualities are worth transmitting.

Manuring.

It cannot be expected that trees will continue to produce heavy crops unless they are supplied with suitable plant food. The stores of plant food in the soil are not inexhaustible, and it is necessary to supply manure or artificial fertiliser. Provided the orchard is in good condition, the present is a suitable month in which to apply fertilisers to citrus trees. They should be worked into the ground just outside the outer circumference of the tree.

Fruit for Canning.

On the Murrumbidgee Irrigation Area a large portion of the fruit crop produced is grown for canning purposes, and growers will be busy this month harvesting peaches and forwarding them to the factory. To secure the best

results peaches for canning purposes must be fully matured, but not over-ripe. The initial essentials to success in the canning of fruit depend upon the grower. Undersized, immature, mushy, carelessly handled fruit cannot give first-class canning results. Unfortunately, there are still growers who hug the fond delusion that a canning factory is a sort of medium for the disposal of inferior fruit. The sooner any grower who harbours this erroneous idea gets rid of it the better. It is no less necessary to grow good fruit and to handle it carefully for canning purposes than it is for marketing in a fresh state.

Harvesting.

Fruit intended for drying is not fit for treatment until it is thoroughly ripe. The proper time for harvesting raisin grapes is when they are quite sweet, and prunes, if intended for drying, should not be gathered until they drop from the tree. Apple and pear growers in inland districts or on the tablelands find that the demand upon their time is imperative. General rules respecting the best time to pick fruit are often misleading, as are most generalisations. William's pears on the one hand, and Josephine de Malines and Packham's Triumph on the other hand, require different treatment. The former may be picked so soon as the fruit has reached a saleable size, for they will mature satisfactorily, but the latter must be allowed to hang until they are well matured. Apples may be marketed as cookers so long as they have reached a suitable size, whether matured or not, but this applies chiefly to the earlier crop. It is better not to market immature apples of a late crop.

Many early varieties of peaches, plums, and apricots marketed this year were extremely small. The market for this class of fruit is always dull in a normal season, and it is generally marketed at a loss to the grower. Growers would therefore be well advised to pay more attention to the thinning of their crops, as by so doing what is lost in number is much more than made up in size and quality. Very heavy crops are a severe strain upon a tree's vitality, and only in exceptional circumstances do they hold and mature to a good commercial size a big percentage of a prolific crop. Thinning is not sufficiently practised. Judicious thinning is so advantageous that it is worthy of inclusion in the operations of the keen and up-to-date grower.

Cultivation.

Orchardists need to bear in mind that this is a critical time for fruit trees, as they are forming blossom buds for the ensuing season, and if the soil has been allowed to harden or to form a surface crust with consequent loss of soil moisture by capillarity the trees are severely handicapped in their development of healthy, vigorous buds for next season. In order to grow fruit successfully—that is, to secure regular crops of good quality and in reasonable abundance—the needs of the tree must be supplied. One of the most important of these needs is soil moisture. It is not hard to keep a tree alive, or trees are wonderfully tenacious of life, but much more than that is

necessary. The life must be vigorous and well sustained; then growth and general development will be satisfactory, foliage will be strong, and healthy, crops will be good and more regular. To secure these important results conserve moisture, keep the soil well tilled, feed the trees, prune skilfully, and practise necessary tree sanitation.

It is a matter worthy of serious consideration whether it is not worth while to keep records of the crops from individual trees. A grower should know which trees are really paying, and which trees are merely profitless cumberers of the soil. The average fruit-grower is accustomed to thinking of profits and of losses in terms of acres, regardless of the fact that, while the acre may return a profit, individual trees may represent a loss, and that the return from the acre could be increased if such trees were replaced. A change from the acre-unit as the basis of profit and loss calculations is both desirable and necessary.

To calculate and keep a record of the exact number of fruit or the exact weight of fruit from each tree would consume an inordinate period of time and would be impracticable. To the average orchardist an estimate of the crop of each tree would be sufficient, as after a little practice growers would soon become proficient in estimating to a nicety the crop of any given tree. The work can be done expeditiously and accurately enough for all practical purposes. The six great factors which determine production are, inherent quality of tree, cultural operations, location, sanitation and manuring, and pruning.

Common Storage of Fruit.

To cold storage, common storage is a valuable auxiliary, especially in the case of those apples which are good keepers, and more especially in climates like Batlow and Orange. What are the chief factors involved in the successful storage of apples? They are, as is well known to most growers, (1) the natural and inherent keeping quality of the fruit itself, (2) picking at the right stage in the development of the fruit, (3) care in picking, (4) promptness in cooling, and (5) suitable storage conditions.

As every observant grower knows, there is a great difference in the keeping qualities of varieties of apples, and experience should be a guide to the period of time during which each variety may be advantageously kept in storage. Apples can, of course, be kept longer in cold than in common storage, but it must always be remembered that fruit does not always reach the consumer so soon as it is released from storage. Care in handling must again be insisted upon, for it is of paramount importance. Common rot organisms will almost of a certainty make their appearance and play havoc with the fruit if the skin is broken. Upon the unbroken skin more than upon any other single factor depends the keeping qualitites of the fruit.

No definite rule can be laid down respecting the maturity of fruits, and therefore the grower must learn by observation and by experience. The colour of the seed and the blush or colour of the variety guide to some extent, but they are not absolutely dependable. The best guide is the ground colour.

Before the apple is ripe the ground colour is green. This gradually lightens and turns to a light yellow as maturity is reached, and not before this colour stage is reached should the apples be placed in storage.

Over-ripeness is a more serious defect than immaturity. The trees should be picked over several times, for the simple and obvious reason that the whole of the fruit of any given tree does not mature simultaneously. After the earlier pickings there will still be immature fruit on the tree, which will improve in size and in marketable quality if left. In respect to size, which is a very important consideration, it may be stated that, generally speaking, apples ranging from 2¼ to 2¾ inches in diameter (roughly 6¾ to 8¼ inches in circumference) will keep for longer periods than large apples. This difference in keeping quality is due not so much to size in itself as to the fact that abnormal size is often due to the forcing that develops abnormal size, and to the immaturity which often accompanies it. At the same time it may be noted again that the rule is not invariable. Apples may develop a good size and keep well.

Very important factors governing satisfactory results in common storage are :—

1. Prompt cooling;
2. Maintenance of even temperature;
3. Amount of atmospheric humidity.

The foregoing pre-suppose that care in handling, so insistently dwelt upon, has been observed. If fruit is exposed to a high temperature for any length of time after picking it become over-ripe, and its keeping qualities are prejudicially affected. If fruit is picked in the heat of the sun and allowed to remain exposed to the sun's rays, it will not keep so long as when it is placed in the shade after picking.

So far as the storage house is concerned, it should be well ventilated and walls should be insulated. Fruit should be stocked in such a way as to secure free air circulation. A stagnant atmosphere is disastrous to the keeping qualities of fruit. Badly designed storage accommodation, badly utilised, instead of retarding, accelerates decay of fruit.

Preservation of Eggs in Silicate of Soda.

Preservation of eggs in silicate of soda (waterglass) has for long been practised by housewives, but the objection has sometimes been taken to this method that it is unpleasant to have to lift the eggs from the solution as required. Experiments were recently carried out by the Department, therefore, to determine what deterioration would result in eggs removed from the preservative, washed, and stored in a dry condition ready for use.

It was shown by the experiments that little if any deterioration takes place as a result of taking eggs out of the waterglass solution for periods up to three weeks before they are used. There were, however, indications that eggs deteriorate in a 5 per cent. solution of waterglass if kept in it over a long period, and experiments are being continued with a stronger solution.—J. Hadlington, Poultry Expert.

VOL. XXXVIII. PART 3. MARCH 1, 1927.

Agricultural Gazette of New South Wales.

Australian Products in Oversea Markets.

REPORTS BY THE HON. W. F. DUNN.

During his recent tour through Great Britain, Canada, and the United States, the Hon. W. F. Dunn, Minister of Agriculture, accumulated a large amount of information regarding the handling of the products of New South Wales overseas, and the possibilities of improvement therein. Since his return, Mr. Dunn has given several addresses on various subjects, but he has also submitted full reports to the Premier, who has now made these available for publication in the *Agricultural Gazette*. In the following pages are given the full text of the reports on certain subjects, and condensations on other matters.

OUR MEAT IN THE UNITED KINGDOM.

THE condition in which Australian meat is marketed in the United Kingdom is so unsatisfactory that it is not difficult to ascertain the reason why our product is not in greater demand in the Home market. Apparently the majority of producers in Australia are concerned merely with the production of meat, and give little thought to a phase of the business which is really of equal importance, viz., the marketing of their product. However, if Australia is to become an important factor in contributing to Great Britain's larder, the producers must give most serious consideration to market requirements abroad and the best methods of complying with them. I am prepared to go further, and to state that they must act promptly if they intend to secure for themselves a satisfactory return on their capital, for the position to-day is that the meat industry of Australia, as far as export is concerned, is moribund and in a hopeless position.

I have returned to Australia fully convinced that our competitors' highly organised efforts in Britain and on the Continent of Europe are so perfect that under our present methods of marketing we have no hope whatever of playing anything but an insignificant part in the business, while such meat as we do send will never be a paying proposition to producers.

I have conversed with men of standing whose lives have been spent in the big markets of Britain, and whose traditions are such as would make them a tremendous asset to our meat growers, if given the opportunity.

Our growers should realise the important fact that, whatever they consider to be the merits of their product, the only practical and safe guide is to accept the appraisement of such centres as Smithfield, Liverpool, Manchester, and Glasgow, and accept their view of the requirements and demands of the trade, which reflect the fancies of the consumers.

Organisation.

Whether the commodity be meat or anything else, no permanent headway can be made without co-ordination and co-operation of producers—in a word, organisation. With no wish to advertise our competitors, still I must pay tribute—particularly to the Americans—to their "up-to-the-minute" methods of meat production and marketing, and while I have not been to

South America, there is abundant evidence in London in support of the general acceptance that the same methods obtain from the point of production until the meat is landed at the consuming end.

Australia must realise that there is a market overseas throughout the year for meat when it can be sold in competition with that of other countries, and further that the world's consumption of meat is greatly outstripping production. Unless Australia utilises her natural resources to meet the present and prospective demand, other countries will. There is evidence that other Dominions, all alive to the future possibilities, are already preparing to share in the same, while even such small States as Iceland, Czecho-Slovakia, Bulgaria, Manchuria, &c., in their small way, have started to export to the British market, and with some comparative measure of success, as evidenced by increasing shipments.

It is also evident that the trend in the South American Republics is for increased sheep production, and as their sheep are mostly British breeds, they must be considered as a factor which will continue to increase and improve in connection with the supply of mutton and lamb in the markets of the world.

If our producers are depending upon Empire preference materially to assist them in marketing their meat or anything else they are, in my opinion, trusting to a broken reed. All things being equal, they can depend upon the British public giving them preference, when and where possible, which latter reservation, translated, means with quality and price the equal or better than that offered by competitors.

Economic conditions in Britain to-day are such that buyers, no less than consumers, are forced to buy in the cheapest market, irrespective of origin; but that feature aside, there is no more sentiment in business there than here, where better value for money is concerned.

As to Quality.

Firstly, with regard to beef, without question the chilled product is preferred to frozen, and when one has seen the superb quality of Argentine "chilled" it permits of no argument, and demonstrates the good judgment of the consumer and his ability to discriminate, statements to the contrary notwithstanding. Without any organisation this meat would command the market, and when one realises the care and attention lavished upon it from the point of production to that of consumption it is easy to appreciate why it is the dominating factor in the market on the other side.

The quality, dressing, and presentation of chilled meat on Smithfield left me with the feeling that unless some drastic steps are taken in Australia along these same lines we cannot hope to hold even that business which we now have.

The demand in Britain is for "baby beef"—steers of from two to three years old—killed in a condition which permits of the utilisation of the meat to a maximum of advantage with a minimum of waste. The Argentine "chilled" fills the bill to the letter. I did see some Australian beef at Smithfield, and, while I am not an expert, it did not take me long to appreciate the reason for its unpopularity.

There is, however, a demand in Britain for good frozen beef, particularly for the provinces, and for our f.a.q. on the Continent; but my investigations satisfied me that consequent upon having no marketing organisation of our own permitting us to get the meat to the consumer in an economical manner, we are strangled from the outset by high overhead charges and keen competition on the small volume of trade handled by many small individual agents, as well as by the trusts, which, excepting for a comparatively small opposition, dominate the marketing from one end of the Kingdom to the other. I understand the remark applies also on the Continent to a greater or lesser degree.

I was credibly informed that, as compared with seven years ago, the outlets for wholesale distribution of our meat in Britain have been narrowed down by 75 per cent., the result of acquisition by the British meat trust of the bigger entities engaged in the trade, thus placing our growers in the hands of a monopoly which manipulates the market just how and when it likes.

Add to this latter fact that where they do not control the cold storage of the country, they do—through a storage committee—fix the rates of storage, which are ruinous to our growers where meat has to be held any length of time. It must be realised that we are in the grip of an octopus from which there is no hope of release unless the growers take some very definite steps to control the selling of their produce and have their own representative on the spot to continue to keep a watchful eye on their interests.

The storage feature is indeed a serious one, as will be seen from the following instances. I was informed that the British trust bought a cold storage plant in Manchester only to close it up, while at Hull it has leased the chief cold storage space for the past twenty years without using it to any extent for the accommodation of meat, for which it was primarily intended. Such state of affairs carries its own suggestion without any further elaboration. It, however, comes down to this: that our people, when they land their meat in Britain, generally have to sacrifice it at the start or else pay heavy storage charges to hold it, which in the end comes to the same thing.

Mutton and Lamb.

While the best Australian lamb and mutton may be the equal of New Zealand, generally speaking the Dominion holds undisputed pride of place for quality, further strengthening her position by being able to give continuity of supply.

South America has outstripped us in the share she contribute towards meeting Britain's requirements. The last few years have also seen a remarkable improvement in quality and grading of the South American articles, no less than in volume, and unless we do something we are going to find our lamb and mutton in no better position than is our beef.

I have been told that, quite frequently, South American mutton fetches higher values than Australian, due to attention given to improvement in quality and particular attention to *grading and dressing*. In these two

latter respects South America is now ahead of us. The trade in Britain has been consulted in the matter of its requirements, and the South Americans have laid themselves out to cater for same—*e.g.*, it was suggested that grading to type no less than quality would be an advantage; the South Americans adopted it, permitting a buyer now of being assured of a straight run of carcases of similar contour in a particular parcel. Again, buyers stated they preferred the tails straight to being skewered to one side; the South Americans appreciated that it added to the attractiveness of the carcases, and met the trade's wishes. Small as these details seem, they have, with others, been responsible for creating increased demand and popularity to an extent that we shall have to look to our laurels if we are to retain any hold on the home market.

The following table shows the yearly importations of frozen mutton and lamb carcases into the United Kingdom in 1923, 1924, and 1925, as given by Messrs. Weddel and Company's Chart:—

	Lamb Carcases.	Mutton Carcases.
South America.		
1923	2,291,004	2,894,454
1924	2,079,968	2,746,216
1925	2,827,922	2,773,717
Total	7,198,894	8,414,387
New Zealand.		
1923	4,490,017	1,724,730
1924	4,624,564	1,984,165
1925	4,480,627	2,192,016
Total	13,595,208	5,900,911
Australia.		
1923	2,125,736	1,609,143
1924	1,180,860	212,228
1925	1,447,411	252,318
Total	4,754,007	2,073,689

South American lamb and mutton for the three years totalled 15,613,281 carcases; Australian lamb and mutton for the three years, 6,827,696 carcases; New Zealand lamb and mutton for the same period, 19,496,119 carcases.

While New Zealand topped South America on lamb shipments, the latter exceeded her by 2,513,476 carcases in respect to mutton. These figures surely bear testimony to the importance of not under-estimating South America as a competitor.

I desire to pay tribute to the work accomplished by Mr. A. R. Hassan, who acted as representative of the Australian Meat Council, and has done much for the industry. During my tour of the ports of Britain, including Liverpool, Manchester, Glasgow, Hull, &c., I found a ready response to any request for information calculated to be of service to our producers. The trade as a whole I found anxious to assist me in every direction, and I was

therefore able to make my investigations under conditions and avail myself of channels of information which, under other circumstances, would not have been possible.

Pork.

While visiting the Smithfield meat markets I found from inquiries that, as a result of an embargo placed against the importation of pork from the Continent, there was a great demand for fresh pork from other countries. The quantity of fresh pork imported from the Continent into the United Kingdom last year amounted to about 1,000,000 cwt., of which 819,843 cwt. was supplied by Holland; this supply will now have to be obtained from other countries. I understand from Messrs. R. and W. Davidson, London, who are agents for the Byron Bay factory, that, as far as they were aware, no fresh pork had been received from Australia, although small quantities of bacon were arriving. They had, however, succeeded in selling a considerable quantity of fresh pork from New Zealand, and there was a likelihood of this trade increasing. The firm stated that there would be no difficulty in disposing of Australian pork, and the price realised on 20th July last for New Zealand pork was 10½d. per lb. c.i.f., and it was expected that the price would rise towards September.

Conclusions.

The attention of our growers should be directed to the information outlined above, and more particularly towards the necessity for:—

Improvement in quality, grading, and dressing.

Regulation of consignments to ensure continuity of supply.

Production of early maturing beef, evenly fattened, to compete with the Argentine.

Obtaining reductions in ocean freight rates to the level of those paid by the Argentine.

Greater care in slaughtering and dressing, and in loading at port of embarkation. (Some carcases show bruises, apparently caused prior to slaughter.)

Greater care in discharging and handling upon arrival in Britain.

Decentralisation of shipments, permitting the commodity to be delivered to the consumer as cheaply as possible, with a view to stimulating consumption.

Control of shipments with a view to meeting market conditions and keeping storage charges at a minimum.

Elimination of unnecessary intermediaries in the marketing of the product.

Scientific investigation into methods of refrigeration with a view to making frozen meat generally more palatable and acceptable to the consumer.

Securing permission to provide and control accommodation for our meat in Britain with a view to reducing the cost of cold storage, and to permit of holding when markets are overstocked.

Establishment of a representative of producers, who will protect growers' interests, and be the medium for advertising and propaganda with a view to popularising our product. Such representative to advise regarding new outlets for our meat, to keep in touch with conditions and report regularly, with a view to keeping our producers abreast of the times, and to investigate complaints regarding supplies.

THE CARRIAGE OF STUD STOCK.

As the result of conferences and correspondence with the representatives of shipping companies trading from the United Kingdom to Australia and with the British Government, Mr. Dunn considerably advanced the prospects of Australian purchasers of stud stock from breeders in Great Britain being able to procure stud animals free of all transport expenses. Such a scheme would be of considerable benefit to the breeders of Great Britain by increasing their sales, and to the breeders of Australia by lowering the cost of high-class stud stock and removing the handicap of increased freights as compared with competitors in the meat trade who are more favourably situated.

Mr. Dunn approached the shipping companies trading between Great Britain and Australia, asking whether they would be prepared to make concessions in freight charges provided the Imperial, Federal, and State Governments would also bear a share of the cost of transport. As a result of his representations the shipping companies have informed Mr. Dunn "that if and when the various Governments, viz., British, Commonwealth, and all the State Governments of Australia evolve a scheme under which the pastoralist in Australia will pay for any stud animals he buys in the United Kingdom only the cost at the point of purchase, and that he will be relieved of all other expenses, and if attached to the scheme there is an arrangement whereby the shipowner can have the assurance that any concession he grants cannot be taken advantage of by dealers or speculators, all sheep, cattle, and pigs shipped under the above scheme will be carried entirely free of freight, the only charge to be made by the shipowner will be actual out-of-pocket expenses, such as stalls, and/or pens, freights on space occupied by fodder, cost of supplying water, &c."

THE GRADING OF WHEAT.

On various occasions during the past few years consideration has been given to the advisability of adopting a system of selling wheat on grade, instead of f.a.q. standard as at present, and although the Department's officers have had actual experience of American and local conditions, they have no knowledge or experience of the selling end of the trade, which is principally in England. It was therefore important that before any action was taken to formulate a grading system, first-hand information should be obtained as to the requirements of the English trade.

Mr. Dunn investigated this matter, consulting with the Incorporated National Association of British and Irish Millers, the Liverpool Corn Traders' Association, and the Overseas Farmers' Co-operative Federations, Limited. He explained that the present f.a.q. system was a very unsatisfactory one in many respects from the farmers' point of view, and undoubtedly was not conducive to good farming; and as it was felt that grading would be in force before long, it was desired to establish a system that would be acceptable to the trade in England and avoid any unnecessary interference with existing practice.

Some hostility to the marketing of Australian wheat on grade was evidenced, as the result of experience in Great Britain of the Canadian system, under which the Government grade certificate is final—the buyer having no redress, no matter how the bulk grain may vary from the sample.

On an assurance being given that the system would concern possibly only three grades according to sample, and would allow the buyer recourse to arbitration should he feel that the wheat delivered was not in accordance with the contract, Mr. Dunn was informed that his tentative proposals would have the general approval of the trade.

As the introduction of a system by means of which wheat grown in New South Wales could be disposed of on grade would be in the interests of those producers who endeavour to improve the quality of their product, Mr. Dunn considers that steps should be taken in that direction, as far as bulk wheat is concerned, as early as possible, and he proposes to take the necessary action with that end in view in the near future.

AUSTRALIAN PRUNES ON THE ENGLISH MARKET.

In view of the heavy planting of prunes which has taken place within the last few years, and the possibility of over-production in the near future, it is essential to find an outlet for the anticipated surplus. It was felt that much valuable information could be gained by personal inquiry as to the possibility of placing our prunes in the United Kingdom, and as to the best means to adopt to test that market properly.

The matter was discussed with quite a number of brokers, wholesale houses, and retailers dealing in canned and dried fruits. The general opinion was that there would be a big demand for Australian prunes, provided they could be placed upon this market in a condition equal to the best samples of Californian and European prunes, and at a price to compete with same.

The following prices for Californian prunes prevailed during the months of April, May, and June last year, those months being selected in view of the fact that probably New South Wales prunes would be available about this time. Prices depend to a great extent on size, but taking an average prune (say, 50-60), the price would not usually exceed £2 11s. per cwt.; from this would have to be deducted about 6s. for freight, insurance, and

landing charges, leaving a net f.o.b. price, Sydney, of £2 5s. per cwt., or, say, about 4½d. per lb. Large fruit (such as 40-50), 6d. per lb.; 30-40, 9d. per lb.; and 20-30, 11d. per lb.

The duty on prunes from foreign countries is 7s. per cwt.—¾d. per lb.—and as Australian prunes enter free, they get preference to that extent.

To test the market in the United Kingdom, Mr. Dunn advised making up two consignment of prunes, sufficiently large to give the fruit a proper trial, and properly packed and graded, one being forwarded to, say, a well-known and reliable broker, and the other to a distributor. In this way a knowledge of how our prunes compare with those of other countries and what is their actual value would be gained, and any faults in packing, quality, &c., that required to be remedied would be ascertained.

The Minister's attention was drawn by merchants dealing in prunes, and by the Agent-General's staff, to the fact that sample consignments of New South Wales prunes forwarded to the English market were found to contain too much moisture in comparison with prunes received from other countries, resulting in sugaring, which is detrimental to their sale.

After carefully reviewing the position, Mr. Dunn, while considering that it was advisable that the oversea markets should be tested, pointed out the great necessity of making every endeavour to develop the local market, as ultimately our prunes would have to depend almost entirely on local consumption.

OUR SURPLUS HONEY.

For several years past the quantity of honey produced in this State has been greatly in excess of the amount required for home consumption, and it has been deemed advisable, if possible, to open up an export trade in order that the surplus may be disposed of to advantage. Inquiries were made in the United Kingdom as to whether such a market could be found for the honey produced in excess of our local requirements.

In this connection it was brought under my notice that a good example of what can be done in this direction was the work of the New Zealand Honey Control Board. This organisation had succeeded in standardising New Zealand honey before shipping to a quality or qualities which were suitable for the English market, and had made such arrangements that a continuity of supply could be assured.

This honey, which is light in colour, and of excellent quality, is brought over in bulk, is bottled in London, and distributed by a wholesale firm to retailers.

New Zealand honey is only sent on to the London market in a set condition, whereas Australian honey is frequently in liquid form, and the tins on landing are frequently leaking.

The most popular varieties of honey are pale to white in colour, though in some quarters (opinions among merchants still vary) the amber coloured product is now preferred. Indeed, one firm who, some few years

ago, asked for New Zealand honey to be as white as possible, have now made requests for the amber colour.

New Zealand honey is only distributed through one house, and as far as possible the price is fixed, the goodwill attaching to it in consequence of care in preparing, advertising, &c. It has a ready sale, and is now recognised as being one of the best honeys, if not the best, imported.

It does not seem probable that Australian honey will, within a reasonable time at any rate, be exported under control as is New Zealand; consequently, while it is making itself known on this market, it cannot expect to realise more than the current market prices.

A proposal was made some time ago that New South Wales bee-keepers should establish a depot in Sydney to which they could forward consignments of honey, and where it would be blended to produce the required standards of colour and flavour; this undoubtedly would be a step in the right direction and would do much to put the marketing of our honey on a proper basis. From what I know of our honey I feel certain that we can supply a quality that would sell well on this market, but to bring high prices, as stated, it would have to be standardised, and a regular supply maintained.

The honey should be handled in the same way as the New Zealand product, that is, it should be sent over in bulk and be bottled in London for distribution. This presents no difficulty, and the added expense would be more than compensated for by the higher price obtained and the fact that we are establishing a goodwill.

The firm which handles the New Zealand honey would undertake the distribution of the New South Wales product, charging 5 per cent. on the sales effected. Being a merchant firm they are as close to the retail trade as it is practicable for an importer to get. Other merchant firms would very likely undertake the business on similar terms, or brokers may be engaged at a commission of 2½ per cent. The honey is usually sent over in 60 lb. tins. These should be strong enough to ensure opening up in good condition.

The market prices for honey, London, 1st July, 1926, were as follow:—

New Zealand,	per cwt. ...	... 55s. to 87s. 6d.
Californian "Clover"	,, ...	... 50s. landed. 48s. c.i.f.
Mexican Light Amber	,, ...	... 40s.
Australian Light Amber,	,, ...	... 45s. to 50s. 42s. 6d. (Mincing Lane).

Taking these rates as a fair example of the relative values of these honeys on the London market, I find that if we allow, say, 6s. per cwt. for freight, insurance and landing charges, the price, f.o.b., Sydney, for Australian honey would be about 4d. per lb., and for New Zealand honey from 5d. to 9d. per lb., New Zealand ports.

This difference in value is not warranted, and as already stated, by standardisation and arranging for regular supplies, the margin can be greatly reduced, if not entirely eliminated.

(To be continued.)

The Better Farming Train.

THE Better Farming Train, to which reference was made in our last issue, has been organised by the Department of Agriculture and the New South Wales Railway Commissioners for the benefit of producers in all districts. The various sections of the train include a wonderful range of exhibits and equipment, demonstrating in the plainest possible manner the latest developments in all phases of agriculture, stock raising, veterinary science, sheep and wool, fruit-growing, poultry-farming, plant diseases, insect life, pasture improvement, and other subjects of vital importance to the man on the land.

The Department's scientific and field officers who will accompany the train are already well known to farmers in many districts, and their advice and recommendations may be relied upon as the result of practical experience. It will take many months for the Better Farming Train to visit all districts, and in view of the various branches of agriculture practised in different areas, it is necessary to alter the make-up of the train from time to time, so that, while the sections of general interest to producers will be maintained, a special feature will be made of the particular form of production in each district visited. The train will therefore proceed by a series of tours, each covering a period of about a fortnight, during which an intensive programme of lectures and demonstrations will be carried out. The itinerary for each tour will be advertised well in advance, and as it will not be possible for the train to remain longer than a day at most centres, farmers who desire to take advantage of this unique opportunity should make a special note of the date upon which it will be in their district. The programme for each day commences about 10 a.m., and the demonstrations and lectures continue until 10 p.m. Hot water is provided for those who desire to lunch at the train, and there is no charge for admission either to the train itself nor to any item on the programme.

The methods by which production may be made more profitable are of foremost importance to the primary producer. As the Minister for Agriculture has aptly put it, "Increasing competition on the world's markets emphasises the need for more economical production, improvement in quality, and the elimination of losses due to drought, pests, and disease. The position in New South Wales will be greatly improved, and the results attained will be more far-reaching, with the Better Farming Train to stimulate interest in the districts visited."

On its first tour the train will visit Harden, Cootamundra, Junee, Wagga, The Rock, Culcairn, Albury, Gundagai, and Tumut.

Farmers' Experiment Plots.

Wheat and Oat Variety Trials, 1926.

WESTERN DISTRICT (PARKES CENTRE).

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

The system of establishing experimental and demonstrational areas under the control of Experiment Committees of the various branches of the Agricultural Bureau and the supervision of the Agricultural Instructor for the district was continued during 1926, and thirteen branches co-operated with the Department of Agriculture in the work. In addition, four other areas (termed "Departmental Areas") were established with farmers who are distant from Bureau branches. Many field afternoons were held during the spring, when inspections of experimental areas and field crop were made, and on some occasions yield-judging contests were held.

Seasonal Conditions.

A full report of seasonal conditions for this part of the west, together with a record of rainfall registrations, appeared in the *Agricultural Gazette* for February, page 124.

Pure Seed Wheat Areas.

Additional pure seed wheat areas have been established during the past year, and the pure seed wheat growers in this portion of the western district now number seventeen. Last year the production of pure seed reached 34,000 bushels, and this season the total was 47,000 bushels. The crops concerned were inspected and passed for type and purity by the Agricultural Instructor for the district, and the seed tested for cleanliness and germination power by the seed testing branch of the Department.

Following are brief particulars concerning the plots for the 1926 season :—

Ootha Bureau.—J. M. Connor, "Kokum," Ootha; soil, red loam; sown, 29th April; seed, 50 lb.; superphosphate, 49 lb per acre

Derriwong Bureau.—C. J. Schlunke, "Lime View," Derriwong; soil, red loam; sown, 1st May; seed, 56 lb.; superphosphate, 56 lb. per acre.

Trundle Bureau.—Mailer Bros., "Trundle Park," Trundle; soil, heavy loam; sown, 4th May; seed, 46 lb.; superphosphate, 56 lb. per acre.

Gunning Gap Bureau.—C. V. Coombs, "Pexthorpe," Bogan Gate; soil, red loam; sown, 29th May; seed, 50 lb.; superphosphate, 60 lb. high-grade per acre.

Nelungaloo Bureau.—E. J. Johnson, "Iona," Wongalea; soil, chocolate clayey loam; sown, 14th June; seed, 75 lb.; superphosphate, 80 lb. high-grade per acre.

Coradgery Bureau.—A. Millgate, "Rockvale," Parkes; soil, red loam; sown, 20th May; seed, 60 lb.; superphosphate, 45 lb. high-grade per acre.

Tichborne Bureau.—W. W. Watson, "Woodbine," Tichborne; soil, silty loam; sown, 8th May; seed, 60 lb.; superphosphate, 60 lb. high-grade per acre.

Cookamidgera Bureau.—B. C. Adams, "Sunnyside," Cookamidgera; soil, red sandy loam; sown 14th May; seed 56 lb.; superphosphate, 60 lb. per acre.

Moura-Reedy Creek Bureau.—A. Pearce, "Sunrise," Murga; soil, red loam; sown, 7th May; seed, 60 lb.; superphosphate, 65 lb. per acre.

Daroobalgie Bureau.—D. L. N. Miller, "Glenlossie," Daroobalgie; soil, heavy chocolate loam; sown, 18th May; seed, 60 lb.; superphosphate, 60 lb. high-grade per acre.

Alectown (Departmental).—J. S. Plowman, "Emu Vale," Parkes; soil, chocolate, clayey loam; sown, 20th to 25th May; seed, 56 lb.; superphosphate, 54 lb. high-grade per acre.

Peak Hill (Departmental).—W. H. Swain "Riverview," Peak Hill; soil, red clayey loam; sown, 20th June; seed, 60 lb.; superphosphate, 56 lb. high-grade per acre.

Manildra Bureau.—E. J. Allen, Manildra; soil, red loam; sown, 25th May; seed, 66 lb.; superphosphate, 56 lb. per acre.

Forbes (Departmental).—T. R. Jones "Birdwood," Forbes; sown, 15th to 20th May; seed, 63 lb.; superphosphate, 55 lb. per acre.

Parkes (Departmental).—R. Job, "St. Elmo," Parkes; soil, sandy red loam; sown, 8th May; seed, 60 lb.; superphosphate, 50 lb. high-grade per acre.

YIELDS of Pure Seed Wheat Areas, 1926.

Variety.	Ootha Bureau.		Derriwong Bureau.		Trundle Bureau.		Gunning Gap Bureau.		Nelungaloo Bureau.		Coradgery Bureau.		Tichborne Bureau.		Cookamid-gera Bureau.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Canberra ...	29	43	20	39	28	0	19	0	29	30	36	53	29	12	27	41
Waratah ...	...		...		28	0	...		20	49	34	0	23	45	...	
Bena ...	...		...		...		...		...		27	8	...			
Federation	29	31	...		31	0	9	0	25	37	34	56	20	28	26	18
Gresley ...	31	51	17	20	22	0	11	0	16	56			29	5	28	43
Clarendon ...	21	32	15	57	...		11	15			...		...		...	
Firbank ...	...		12	18	...		...		...		...				...	
Wandilla ...	...		...		...		...						...		...	
Florence ...	...		...		...		...		...		...				...	
Yandilla King	...		...		...		...		...		...				27	25

Variety.	Moura-Reedy Creek Bureau.		Daroobalgie Bureau.		Alectown (Departmental).		Peak Hill (Departmental).		Manildra Bureau.		Forbes (Departmental).		Parkes (Departmental).	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Canberra ...	31	11	25	0	36	13	19	0	15	17	37	0	31	54
Waratah ...	32	48	19	17	33	12	21	0	19	35	32	30	...	
Bena ...	27	15	...		33	9	...		...		40	0	...	
Federation	...		31	15	32	37	19	0	20	36	31	30	27	42
Gresley ...	37	16	28	43	32	9	...		17	49	23	0	25	42
Clarendon ...	...		...		...		...		...		...		...	
Firbank ...	...		...		...		...		...		...		...	
Wandilla ...	...		...		...		...		22	46	36	0	...	
Florence ...	...		...		...		...		...		24	0	...	
Yandilla King	30	28	...		...		...		...		...		23	34

Wheat Variety Trial.

Ootha Bureau.—G. H. Heinrich, "Mayfield," Ootha; soil, red loam; sown, 3rd May; seed, 45 lb.; superphosphate, 45 lb. high-grade per acre.

Murrumbogie Bureau.—B. R. Blundell, "Forest Vale," Fifield; soil, chocolate clayey loam; sown, 20th April; seed, 66 lb.; superphosphate, 76 lb. per acre.

Derriwong Bureau.—C. J. Schlunke, "Line View," Derriwong; soil, red loam; sown, 3rd May; seed, 56 lb.; superphosphate, 50 lb. per acre.

Gunning Gap Bureau.—P. F. Darcy, "Innes Vale," Bogan Gate; soil, light loam; sown, 6th May; seed, 60 lb.; superphosphate, 56 lb. per acre.

Nelungaloo Bureau.—G. F. Mill, "Hazlemere," Gunningbland; soil, chocolate clayey loam; sown, 15th May; seed, 58 lb.; superphosphate, 48 lb. high-grade per acre.

Coradgery Bureau.—W. A. Woods, "Rosedale," Parkes; soil, chocolate loam; sown, 27th May; seed, 60 lb.; superphosphate, 67 lb. high-grade per acre.

Tichborne Bureau.—S. Tomkins, "Westnook," Tichborne; soil, blackish clayey loam; sown, 18th May; seed, 60 lb.; superphosphate, 50 lb. high-grade per acre.

Tichborne Bureau.—R. M. Ashcroft, "Allengrove," Tichborne; soil, light loam; sown, 4th May; seed, 60 lb.; superphosphate, 47 lb. high-grade per acre.

Daroobalgie Bureau.—H. F. Allen and Sons, "Mayura," Forbes; soil, red clayey loam; sown, 4th May; seed, 60 lb.; superphosphate, 45 lb. high-grade per acre.

Peak Hill (Departmental).—J. Jelbart, "Penryn," Trewilga; soil, chocolate clayey loam; sown, 8th to 24th May; seed, 60 lb.; superphosphate, 56 lb. per acre.

Parkes (Departmental).—J. T. Townsend, "Willow Vale," Parkes; soil red loam; sown, 22nd June; seed, 75 lb.; superphosphate, 70 lb. per acre.

[The soil was wet and cold at sowing time; the germination was not good, and the stooling and growth rather poor.]

Trundle Bureau.—Metcalf Bros., "Gillenbine," Trundle; soil, chocolate loam; sown, 3rd May; seed, 56 lb.; superphosphate, 56 lb. per acre.

A wheat variety trial was also conducted by Mr. J. S. Plowman, "Emu Vale," Parkes, in conjunction with the pure seed-wheat areas. The complete results were as under :—

	bus.	lb.		bus.	lb.
Canberra	36	13	**Gresley**	32	9
4 G	34	27	**206**	31	55
4 U	33	22	**212 C**	31	12
Waratah	33	12	**212 B**	30	52
Bena	33	9	**210**	30	32
Federation	32	37	**212 G**	25	2

The numbered varieties are the results of crosses and selections made by Mr. Plowman during the past fourteen years.

Variety trials were also sown on the properties of Messrs. G. W. Cutler, Mandagery, and J. Davie, Daroobalgie, but the results of the former were not comparable, due to excessive rain, and the records of the latter were destroyed as the result of bush fires.

YIELDS of Wheat Variety Trials, 1926.

Variety.	Ootha Bureau.	Murrumbogie Bureau.	Derriwong Bureau.	Gunning Gap Bureau.	Nelungaloo Bureau.	Coradgery Bureau.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Canberra	27 42	36 0	19 41	26 45	34 38	32 31
Waratah	22 0	......	19 38	25 45	......	25 9
Bena	21 30	......	......	......	35 53	26 26
Gresley	24 34	......	16 56	27 50	31 57	24 10
Clarendon	18 54	......	......	......	......	......
Rajah	22 30	......	......	......	......	......
Caliph	......	39 16	......	......	......	......
Gluyas Early ...	......	26 24	20 6	......	......	......
Binya	......	......	16 45	......	28 35	......
Wandilla	......	......	......	......	34 46	......
Federation	......	......	......	......	......	24 2
Baroota Wonder ...	......	......	......	......	......	22 1
Turvey	......	......	......	......	......	......
Gallipoli	......	......	......	......	......	......
Yandilla King ...	......	......	......	......	......	......
Improved Steinwedel	......	......	......	......	......	......

Variety.	Tichborne Bureau. (S. Tomkins).	Tichborne Bureau. (R. M. Ashcroft)	Daroobalgie Bureau.	Peak Hill (Departmental).	Parkes (Departmental).	Trundle Bureau.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Canberra	30 48	42 30	21 34	30 21	11 21	......
Waratah	29 50	37 30	21 34	28 0	12 20	28 3
Bena	31 56	......	27 48	......	......	32 2
Gresley	......	......	......	......	......	......
Clarendon	......	......	......	24 1	10 33	......
Rajah	......	......	......	......	......	......
Caliph	......	......	......	......	......	37 3
Gluyas Early ...	......	......	......	......	......	......
Binya	......	......	......	......	......	......
Wandilla	......	31 0	23 1	......	......	......
Federation	35 8	28 0	......	28 57	......	30 37
Baroota Wonder ...	28 4	39 30	22 21	......	......	......
Turvey	33 20	......	23 1	27 56	......	26 45
Gallipoli	......	......	......	24 59	......	......
Yandilla King ...	......	......	......	25 46	......	35 2
Improved Steinwedel	......	......	......	......	......	26 13

Comments on Varieties.

When Waratah was introduced to the district three years ago, the opinion was expressed that it might be a rival to Canberra, but averaging the variety trial results in 1925, Canberra shows the better return by 1 bus. 27 lb. per acre, and in 1926 by 3 bus. 54 lb. per acre. The Western District crop competitions of 1926 showed that almost an equal number of crops of Waratah and Canberra were exhibited, and that Waratah crops were more favourably placed than Canberra.

Canberra has always proved the most consistent yielding early-maturing wheat we have for the western district, and although Waratah has been performing exceptionally well, it is not possible to recommend it in preference

to the old favourite. Waratah seems to be slightly less subjected to flag smut, and certainly has a stronger straw, which may be worth consideration in some instances.

Bena, which was first tried here in 1925, promises well, and it is likely to displace such varieties as Yandilla King, Barootà Wonder, and Turvey. It has tested well in the plots, and in two competition crops yielded 44 bushels and 40 bushels per acre respectively. It is a medium stooling, midseason wheat of medium height, carrying a fair amount of flag, and has particularly pleasing heads, medium to long, compact, and well filled. The variety evidently has a good constitution, and very high yielding crops are possible. All seed has been eagerly purchased by western farmers.

Gresley is giving satisfactory yields, but is only recommended for sowing on land that has been badly affected with flag smut, as it is rather resistant to this disease.

Pure Seed and Variety Trials of Oats.

The main purpose of these areas is to produce supplies of pure clean seed. The grain yield factor is not all-important, as the type of oat desired in the west is one that gives the greatest and quickest early growth of sweet and palatable qualities for grazing purposes, and that makes rapid subsequent growth, when stock are removed, enabling fodder to be conserved in the form of silage, hay, or grain.

Derriwong Bureau.—C. J. Schlunke, "Line View," Derriwong; soil, red loam; sown, 13th May; seed, 40 lb.; superphosphate, 50 lb. per acre.

Ootha Bureau.—C. W. Buckland, "Kangetong," Ootha; soil, red loam; sown, 7th May; seed, 43 lb.; superphosphate, 45 lb. per acre. The Lachlan oats became tipped in the dry spring, and about 3 bushels per acre shelled in strong winds. Mulga was harvested ten days earlier.

Murrumbogie Bureau.—Curr Bros., Murrumbogie; soil, red loam; sown, 7th May; seed, 40 lb.; superphosphate, 56 lb. per acre.

Gunning Gap Bureau.—W. J. Dwyer, "Daisy Park," Bogan Gate; soil, red loam; sown, 6th May; seed, 50 lb.; superphosphate, 38 lb. per acre. Buddah was over-ripe when stripped, and had shelled badly; other varieties were stripped while in good condition.

Nelungaloo Bureau.—A. Scrivener, "Hildavale," Gunningbland; soil, chocolate loam; sown, 26th May; seed, 60 lb.; superphosphate, 60 lb. per acre.

Coradgery Bureau.—A. Millgate, "Rockvale," Parkes; soil, red loam; sown, 18th June; seed, 44 lb.; superphosphate, 60 lb. high-grade per acre.

Daroobalgie Bureau.—W. R. Gunning, "Clothilde," Daroobalgie; soil, red, clayey loam; sown, 16th June; seed, 50 lb.; superphosphate, 45 lb. per acre.

Cookamidgera Bureau.—T. B. Ellis, "Happy Valley," Cookamidgera; soil red loam; sown, 9th June; seed, 50 lb.; superphosphate, 60 lb. high-grade per acre.

Peak Hill (Departmental).—W. H. Swain, "Riverview," Peak Hill; soil, red, clayey loam; sown, 20th June; seed, 40 lb.; superphosphate, 56 lb. high-grade per acre.

Moura-Reedy Creek Bureau.—Carey Bros., Murga; soil, light loam; sown, early May; seed, 65 lb.; superphosphate, 60 lb. per acre. Plots fed off with sheep till end of August, and owing to absence of spring rains. Subsequent growth was short and light.

Forbes (Departmental).—H. Green, "Kiora," Forbes; soil, silty, red loam; sown, 16th April; seed, 60 lb. superphosphate, 60 lb. high-grade per acre. Fed off in June. Windy weather thrashed out about half the grain prior to stripping.

Parkes (Departmental).—J. S. Plowman, "Emu Vale," Parkes; soil, chocolate clayey loam; sown, 1st June; seed, 50 lb.; superphosphate, 56 lb. per acre.

Tichborne Bureau.—M. B. Thurn, "Avoca Vale," Tichborne; soil, silty loam; sown, 6th May; seed, 50 lb.; superphosphate, 60 lb.

Trundle Bureau.—T. E. Kitamura, "Jordan Valley," Trundle; soil, red loam; sown, 5th June; seed, 40 lb.; superphosphate, 60 lb. per acre.

YIELDS of Oats in Pure Seed and Variety Trials, 1926.

Variety.	Derriwong Bureau.	Ootha Bureau.	Murrumbogie Bureau.	Gunning Gap Bureau.	Nelungaloo Bureau.	Coradgery Bureau.	Paroobalgie Bureau.	Manildra Bureau.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Mulga	33 12	40 0	39 8	66 12	30 0	38 14	14 16	34 5
Lachlan	16 39	23 0	28 32	61 12	27 20	27 30	12 32	27 29
Buddah	......	......	......	39 12	......	36 14	15 24	......
Belar	......	......	......	51 12	......	27 27	11 0	......
Algerian	......	......	......	......	......	......	......	33 18

Variety.	Cookamidgera Bureau.	Peak Hill (Departmental).	Moura-Reedy Creek Bureau.	Forbes (Departmental).	Parkes (Departmental).	Tichborne Bureau.	Trundle Bureau.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Mulga	29 0	20 0	24 17	30 36	25 27	60 0	8 13
Lachlan	26 36	18 0	20 27	30 26	29 12	54 0	7 0
Buddah	......	......	......	......	......	......	9 0
Belar	......	......	......	......	......	......	5 14

Pure seed plots were also sown on the property of Mr. J. Aitken, Mickibri, but failed owing to wet conditions delaying sowing until July.

Fertiliser Trials.

The quantities of superphosphate tested varied according to the locality and conditions. In some centres the no-manure plot was eliminated, as such a plot means the loss of probably two bags of wheat per acre to the farmer.

Ootha Bureau.—W. J. Sanderson, "Avilla," Ootha; soil, red loam; sown, 20th May; seed, 60 lb.; variety, Gresley.

Derriwong Bureau.—R. Doberer, "Good Hope," Derriwong; soil, red loam; sown, 2nd May; seed, 55 lb.; variety, Gresley.

Trundle Bureau.—K. Gault, "Lynwood," Trundle; soil, red clayey loam; sown, 4th May; seed, 45 lb.; variety, Gresley.

Gunning Gap Bureau.—W. J. Dwyer, "Daisy Park," Bogan Gate; soil, red loam; sown, 5th June; seed, 60 lb.; variety, Canberra.

Tichborne Bureau.—W. Tyrrell, "Oakleigh," Tichborne; soil, silty loam; sown, 12th May; seed, 60 lb.; variety, Canberra.

Tichborne Bureau.—W. W. Watson, "Woodbine," Tichborne; soil, silty loam; sown, 14th May; seed, 60 lb.; variety, Canberra. Mr. Watson also conducted a gypsum trial, applying 10 cwt. and 20 cwt. per acre of Victorian and Trida gypsum, but the plots were burnt by bush fire before harvest. No difference in growth was noticeable.

The heavier applications of superphosphate are proving profitable, and in every trial the highest quantity applied gave the best yield. It seems that 60 lb. per acre is the safe minimum standard for the west, and the quantity may be as high as 112 lb. per acre, according to the class of fallow, and other governing factors.

YIELDS in Fertiliser Trials.

Fertiliser per acre.	Ootha.	Derriwong.	Trundle.	Gunning Gap.	Tichborne (W. Tyrrell).	Tichborne (W.W. Watson).
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
No manure ...	10 30	20 0	20 10	17 9	...	...
40 lb. superphosphate	...	22 0	23 40	...	26 30	...
45 lb. ,,	16 30		...	20 45	...	...
60 lb. ,,	21 0	...	22 30	...	24 39	38 20
66 lb. ,, ..	...	...	..	21 11	...	...
70 lb. ,,	.	23 0	...	..	...	...
80 lb. ,, ..	...	...	24 16	...	27 39	...
88 lb. ,,	..	.	...	21 28	...	...
98 lb. ,, ...	..	..	...	...	...	37 7
100 lb. ,, ..	...	24 0	...	...	...	...
120 lb. ,, ..	..	..	...	.	.	41 15

Fertiliser tests were also sown on the properties of Messrs. J. S. Grant, of Trundle, and G. Tanswell, Parkes, but as the result of excessive rains, yields were not comparable. A cultivation experiment sown on the farm of Mr. E. C. Benzeville, Trundle, also failed owing to wet sowing conditions and weed growth.

Rate of Seeding Trials.

Trundle Bureau.—Mailer Bros., "Claris Park," Trundle; soil, red loam; sown, 12th May; superphosphate, 56 lb. per acre; variety, Canberra.

Gunning Gap Bureau.—W. Scott, "Deloraine," Bogan Gate; soil, red loam; sown, 16th May; superphosphate, 56 lb.; variety, Waratah.

Gunning Gap Bureau.—C. V. Coombs, "Poxthorpe," Bogan Gate; soil, red loam; sown, 3rd July; superphosphate, 60 lb.; variety, Waratah. Very late sowing, owing to excessive winter rains, was responsible for low yields.

Tichborne Bureau.—W. Tyrrell, "Oakleigh," Tichborne; soil, silty loam; sown, 12th May; superphosphate, 47 lb. high-grade; variety, Canberra.

Daroobalgie Bureau.—D. L. N. Miller, "Glenlossie," Daroobalgie; soil, chocolate heavy loam; sown, 18th May; superphosphate, 60 lb. high-grade; variety, Federation.

The results of experiments, and the observations made when judging crop competitions, indicate that with the standard variety Canberra, graded, treated with dry copper carbonate, and sown prior to the 15th May, 60 lb. of seed per acre should be used.

YIELDS of Seeding Trials.

Seed per acre.	Trundle.	Gunning Gap (W. Scott.)	Gunning Gap (C. V. Coombs.)	Tichborne.	Daroobalgie.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
45 lb.	32 0	21 36	....	24 21	......
50 ,, ...	......	.....	......	......	26 7
55 ,, ...	33 0	. ...	... ..	26 23	....
60 ,, ...	. ..	23 6	9 48	......	23 20
65 ,, ...	28 0	. ..	....	23 38	......
70 ,, ...	. ...	..... .	11 51	. .	27 0
75 ,, ...	......	24 18	.. ...	.....	......
84 ,, ...	......	......	13 30	... ..	.. ...

THE IRRIGATION AREA AND ADJOINING COUNTRY (Yanco End).

W. R. WATKINS, H.D.A., Agricultural Instructor.

The following farmers co-operated with the Department in conducting trials with wheat during the season 1926:—

E. McKenzie, Brobenah, via Leeton.
T. C. Davis, "Parkside," Brobenah, via Leeton.
E. J. Lovell, Farm 53, Leeton.
F. Williams, via Leeton.
O'Callaghan and Robertson, via Leeton.
W. Minchin, Farm 387, Wamoon.
F. Edwards, Farm 367, Leeton.
J. Oslington, Farm 353, Leeton.
W. T. Bell, Farm 944, via Whitton.

Owing to heavy rains early in the season, the plots on Farm 944 were sown very late. Poor germination resulted, causing uneven and patchy growth, and comparable results were unobtainable.

The Season.

The seasonal rains commenced early, the weather breaking towards the end of March, and continued practically right through the winter. On the lighter and more open classes of soil sowings were handicapped very little, although spread over a slightly longer period than usual owing to the showery conditions. On the heavier clayey land trouble was met with owing to the water lying on the land, the result being that on some farms to complete sowings the seed was sown on boggy soil, which only results in failure on soil of this heavy type.

The conditions favoured crops on the lighter loamy soils on the non-irrigable land, surrounding the greater portion of the Irrigation Area, the impervious clay sub-band which prevents excessive water from soaking in on the majority of the irrigable farms being absent here. Owing to the wet winter very few frosts were experienced until early spring; these had their effects on the late sown crops on heavy land.

The rainfall from June, 1920, was as follows :—June, 247 points; July, 158; August, 110; September, 68; October, 76; November, 223; December, 3; January, 1926, 16; February, 0; March, 89; April, 402; May, 156; June, 159; July, 158; August, 200; September, 126; October, 122; November, 13; Total 2,426 points.

The Plots.

Brobenah (E. McKenzie).—Virgin red loam land. Ploughed, July, 1925; springtoothed September, harrowed February, and Wimmera cultivated May; sheep on the fallow. Plots were sown on 5th May, using 45 lb. of seed and 45 lb. of superphosphate per acre. The germination was excellent throughout and all varieties made good growth. A little flag smut appeared in all varieties in August but did no damage. Canberra was the only variety in which loose smut appeared, but was only slightly affected. All varieties headed out well and the grain was large and plump. The plots were harvested towards the end of November.

Brobenah (T. C. Davis).—The soil was a good red loam which had been cropped to wheat for sixteen years. The land was fallowed in July, disced in September, springtoothed March, and again in May. Sheep were run on the fallow. The plots were sown on 12th May. Germination was excellent in all plots, and it was soon evident that the heavy dressings of superphosphate were having an effect on the growth as in both heavily-dressed plots the growth was quicker and the plants more sturdy, and the stooling was more pronounced. On this land, which had been cropped continuously for many years, more pronounced results would have been obtained had the rate of seeding been heavier. It should be pointed out that through unavoidable circumstances only half the plot sown with 60 lb. of seed and 45 lb. of superphosphate was fallowed, hence the lower return. The plot sown with 60 lb. of seed and 100 lb. superphosphate could be picked out at all stages of growth, being taller, denser, and better headed; this plot also ripened slightly

ahead of the others. Flag smut was in evidence in all plots, but only slightly. Harvesting was carried out towards the end of November.

Farm 53.—The plots were sown on non-irrigable land close to the Area. The soil was of a light red loam nature. It was fallowed in September, sundercut February, and springtoothed April. It had been previously cropped with wheat, and sheep were run on the fallow. Sowing was carried out on 20th May, using 60 lb. of seed with 70 lb. of superphosphate per acre, the land being harrowed after sowing. Germination was excellent in all plots, but during August flag smut, take-all, and foot-rot made their appearance throughout the whole paddock. All varieties were very badly affected, especially by flag smut, which practically ruined the crop. The stooling was considerably affected, and the grain was pinched. Wandilla, although badly affected by flag smut, gave a fairly good sample of grain. Harvesting was carried out early in December.

F. Williams.—The plots were sown on non-irrigable land close to the Area. Virgin land of a light red loam nature; fallowed in August, springtoothed November, Wimmera cultivated March, harrowed May. Sowing was carried out on 23rd May, using 60 lb. of seed and 70 lb. of superphosphate per acre. Germination was good in all plots, but with the continued rainy weather crowfoot made very rapid growth, which considerably thinned out the plants, making the plots very patchy. Flag smut affected all varieties, Bena showing the most. Canberra and Waratah made the best growth throughout, and were the least affected by flag smut. Harvesting was carried out towards the end of November.

O'Callaghan and Robertson.—These plots also were sown in the vicinity of the Area on non-irrigable land which had been previously cropped to wheat. The land was fallowed in July, springtoothed in October, and disced in March. The plots were sown on 26th April, using 60 lb. of seed and 45 lb. of superphosphate per acre. The soil was a yellow clay loam. Germination was good and the plants made good growth. Very little flag smut was noticeable and practically no take-all or foot-rot. Harvesting was carried out early in December.

Farm 387.—The plots were sown on heavy red clay on irrigable land which had been previously cropped with oats. Fallowed in July, left in the rough and watered in February, springtoothed, late February, and disced in March. Sowing was carried out on 19th April, using 60 lb. of seed and 70 lb. of superphosphate in the variety trial. Just as the plants were showing through the heavy rains of April commenced, when over 4 inches fell, drowning out portions of each plot and leaving the remainder very patchy. Wandilla, Aussie, and Binya (which was cut for hay) suffered the worst, the remaining varieties being on slightly higher land. Waratah, although in the lowest portion of the paddock, withstood the wet conditions wonderfully and made good growth. Yandilla King again showed its adaptability to wet conditions, and is the best variety for early sowing on the heavy clay land of the Area.

The results of the manurial trial cannot be taken as a true comparison; as already stated, the land was practically under water for a considerable period and portions of the plots were drowned out. Harvesting was carried out to the middle of November.

Farm 367.—The plots on this farm also were sown on heavy red clay irrigable land, but no watering was carried out prior to sowing. Stubble land, ploughed in January, springtoothed in March. Sowing was carried out on 14th April with a combine drill, using 60 lb. seed and 70 lb. of superphosphate per acre, and land was harrowed after sowing. Germination was very good throughout but the rains of April considerably thinned the plots, especially in the case of Gresley. Yandilla King and Turvey, the two late maturing varieties, again kept up their name as suitable varieties that will stand wet conditions on heavy clay land. Waratah in these plots also withstood the wet conditions very well, and it looks like the early maturing variety that is so badly needed for the heavy clay soils of the area for later sowings. Harvesting was carried out early in December.

Farm 353.—The plots were sown on heavy red clay irrigable land, but no watering was carried out. Stubble land, ploughed in January, springtoothed in March, and again in April. The plots were sown on 18th of May, using 60 lb. of seed and 70 lb. of superphosphate per acre, and harrowed after sowing. Germination was good in all plots but weed growth was very prevalent, and this, in conjunction with the wet conditions, considerably thinned the stands, leaving the plots very patchy. Yandilla King proved again the most suitable variety for this class of land. Harvesting was carried out early in December.

RESULTS of Variety Trials.

Variety.	Brobenah (E. McKenzie).	Farm 53.	J. E. Williams.	O'Callaghan & Robertson.	Farm 387.	Farm 367.	Farm 353.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Gresley	35 0	...	19 24	...	21 30	17 30	12 40
Binya	32 0	13 30	...	24 30	Cut for hay.	20 10	17 30
Canberra	40 36	...	24 30	...	...	22 0	...
Bena	35 32	...	22 50	...	20 0	21 0	...
Wandilla	33 36	24 15	...	...	19 40	...	...
Turvey	35 30	...	21 40	...	...	28 40	...
Union	35 10	18 30	...	...	22 30	...	...
Federation	33 50	15 45	...	27 10	...	26 0	...
Waratah	...	17 30	24 45	28 0	25 30	26 15	...
Penny	...	...	...	...	Cut for hay.	...	...
Yandilla King ...	...	...	...	...	24 0	29 35	20 0
Clarendon	...	...	...	...	...	...	12 0
Zealand	...	...	...	...	...	...	12 0
Marshall's No. 3 ...	...	...	...	...	...	...	15 30
Aussie	...	20 7	...	...	19 15	...	...

Except in the case of Mr. McKenzie's plots at Brobenah, where the rate was 45 lb., the rate of seeding was 60 lb. per acre; 45 lb. of superphosphate per acre was applied to Mr. McKenzie's plots and those of Messrs. O'Callaghan and Robertson, and 70 lb. in the cases of the remainder.

RESULTS of Rates of Seeding and Superphosphate Trials.

Amount of Seed.	Amount of superphosphate	Brobenah (T. C. Davis).	Farm 387.
lb.	lb.	bus. lb.	bus. lb.
60	45	27 35	....
60	70	31 30	25 30
60	100	33 0	....
45	45	28 30	....
45	70	28 30	....
45	100	30 0	....
60	85	....	22 30
60	110	....	21 0

In both cases Waratah was the variety used.

The plots at Farm 387 were on heavy red clay soil on which the excessive rains of the winter lay for a considerable period, drowning out portions of the trials and so spoiling comparable results. The plots at Brobenah were on typical red loam wheat land that had been continuously fallowed and cropped for sixteen years.

Remarks.

Adjoining the Irrigation Area there is a considerable amount of good wheat land which comes under the control of the Water Conservation and Irrigation Commission, and which has been practically lying idle, small portions of it being used for grazing purposes for dry cattle from the Area. Within the last few years small areas have been allotted to a few of the settlers as additional dry area land, and they have wasted no time in bringing it to the useful and payable proposition of wheat growing.

For successful wheat growing, on either the irrigable or the dry-area land, it is necessary for settlers to pay more attention to the working of the land and the preparation of good seed-beds. The majority of the dry-area land is red loam, inclined to be open in texture, and should not be worked too deep. Early fallow is a necessity; the fallow should not be ploughed more than 3½ inches deep and all subsequent cultivations should be at the one depth to bring about compaction of the subsurface soil. Deep ploughings and workings of this class of land tend to keep the soil too loose and open. Springtooth and Wimmera cultivators are ideal implements for the working of the fallows, the disc being seldom needed. A mouldboard plough is preferable to a disc.

As regards the clayey soils found on the majority of the irrigable farms, the tendency is to plough about March and sow in April or May after one cultivation. This class of land needs early fallowing, and ploughing can be deeper, according to the depth of the clay land from the surface. Ploughing should be done before the soil has dried from the winter rains; the land should not be ploughed wet, but it needs to be moist. One, two, or three cultivations will be needed before February, when the land should be well watered, the clay band being allowed to become saturated. As soon as the surface is

dry enough cultivations should commence, and from then on the land should be worked down for sowing about April. Care should be taken not to fine the surface; it should be worked to a fairly cloddy condition so as to prevent "running together" when the seasonal rains commence.

Another important point to remember is to sow suitable varieties at the correct time. One sees too much of varieties like Yandilla King, Marshall's No. 3, and Turvey being sown in May and June. Late maturing varieties, such as Yandilla King, Marshall's No. 3, Turvey, Penny, and Major should be sown early, and early maturing varieties, such as Gresley, Canberra, Waratah, and Federation later.

RIVERINA DISTRICT.

G. C. BARTLETT, H.D.A., Agricultural Instructor.

THE following farmers co-operated with the Department in conducting cereal experiments during 1926:—

A. Jennings, "Raywood," Coolamon.
T. E. Lewis, "Glen Ayr," Coolamon.
Gollasch Bros., "Pine Park," Milbrulong.
W. Thornton, "Spring Farm," Berrigan.
H. J. Matthews, "Hanley Park," Deniliquin.
W. Glenn, "Minerva," Mathoura.

The Season.

An adverse sowing season was experienced in the southern districts generally. The summer was very dry, and this continued until well into the autumn. Very little weed growth took place over the summer, and very little cultivation was possible. This was followed by very heavy rains in late March and through April, which resulted later on in a heavy growth of wild oats and Cape weed, and, being followed by continuous rains, sowing became very difficult. In many cases the crops had to be rushed in in the wet. At Coolamon nearly 5½ inches of rain fell in April, followed by heavy rains in May and June. This was followed by a mild winter, resulting in rank growth, while it remained too wet to feed the crops off. Under these conditions winter blight (*Septoria tritici*) developed considerably in some districts and weakened the straw. Cool changes and high winds in November resulted in a good deal of lodging. Later on, in December, hot westerly gales thrashed the crops to such an extent as to reduce ten-bag averages to seven and six in many instances.

In the far west, at Deniliquin and Mathoura, conditions were more moderate and these crops ripened much earlier, and could be stripped before the destructive winds in December. Hot winds were experienced in September, and the rain from June consisted mainly of light, scattered showers.

The results show what is being produced by present-day fallowing methods in districts with only a 12-inch rainfall.

RAINFALL.

1926.	Coolamon.	Milbrulong.	Berrigan.	Deniliquin.	Mathoura
	pts.	pts.	pts.	pts.	pts.
January	10	113	0	130	97
February	0	0	0	0	0
March	140	202	271	168	299
April	535	259	430	288	242
May	163	139	90	149	161
June	290	250	170	99	74
July	218	153	118	92	70
August	160	322	121	251	120
September	145	213	129	131	58
October	168	168	91	167	113
November	8	15	0	0	4
December	32	25	0	0	0
Total for the Year ...	18·69	18·59	14·27	14·75	12·38
Total on Crop ...	11·52	11·99	7·20	7·40	6·00

Diseases.

In Central Riverina the winter blight (*Septoria tritici*) was very prevalent, especially round Coolamon, where very heavy seedings were practised. The season was mainly responsible for this, as previously mentioned. With the present methods of seed treatment and the use of the dry copper carbonate powder no bunt was seen in the plots. Foot-rot, take-all, and flag smut were in evidence generally, and in some cases to a large extent. Farmers are now recognising the value of summer fallow and oats in the control of these diseases. The latter diseases were particularly in evidence on the plots at Deniliquin; loose smut was in evidence in a small way, but not sufficient to cause any appreciable loss. Only traces of rust and practically no mildew were noticed.

Cultural Operations.

Coolamon.—Previous crop, wheat; paddock cultivated for forty-six years; soil, medium red loam; mouldboard ploughed 4 inches deep in July; scarified in February, harrowed in March, scarified in April, harrowed in mid-May and sown 19th May; sheep on the fallow over the summer. The wheat was sown at 75 lb. per acre, oats at 60 lb., and superphosphate at 56 lb. A loss of 2 bushels per acre was sustained by a hailstorm, and a further bigger loss was occasioned by hot westerly gales in early December. The oats were harvested before this.

Milbrulong.—Previous crop, wheat; land had been under wheat and fallow for years; soil, medium to fairly strong red loam; stubble fed off, then burnt and springtoothed in April. Mouldboard ploughed 4 inches deep end July; then springtoothed deeply in October; fallowed by shallow scarifying in November; again in January, March, and April. Springtoothed in May prior to sowing. Sown on 13th May, using 75 lb. wheat, 55 lb. oats; 84 lb.

of high grade superphosphate was sown with the wheat, and 56 lb. with the oats. The fallow was excellently worked, but all the plots suffered by a mild winter, producing rank growth which was followed by windstorms. Bena and Waratah wheats and Buddah and Sunrise oats particularly suffered.

Berrigan.—Previous crop, wheat; soil, heavy red loam; mouldboard ploughed 4 inches deep in August and harrowed in September; rolled in October; springtoothed in March; scarified in May; springtoothed again and harrowed prior to sowing; sown on 14th May, using 60 lb. seed and 80 lb. superphosphate per acre.

Deniliquin.—Previous crop, wheat; soil, heavy, silty dark loam, river country; mouldboard ploughed 4 inches deep in September, and harrowed in October; springtoothed and harrowed in May; sown 25th May, using seed at 66 lb. and superphosphate at 56 lb. per acre. This soil, a silty river flat, was unsuitable for wheat growing, but the farmer stated that although the yields were low they were considerably above those of his own crops, due to the use of good seed.

Mathoura.—Previous crop, wheat; soil, medium red loam, typical of the timber country of the district; mouldboard ploughed 4 inches deep in July and harrowed; springtoothed with harrow points to the full depth in November; then left over the summer with sheep on, and cross-harrowed in March after heavy rain; springtoothed shallow with 5-inch points prior to sowing; sown with disc drill on 29th April, and harrowed after sowing, using 58 lb. seed and 74 lb. superphosphate per acre.

RESULTS of Variety Trials.

Variety.	Coolamon.	Milbrulong.	Berrigan.	Deniliquin.	Mathoura.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Federation	20 0	25 57	28 51	17 0	32 0
Bena	19 0	22 5	...	15 0	28 39
Huff's Imperial	...	...	...	...	29 50
Union	...	29 17	32 40	15 0	32 4
Binya	18 0	...	...	...	16 47
Waratah	15 0	21 16	27 41	16 0	27 12
Cargo	...	...	24 40	...	...
Canberra	...	...	28 5	...	...
Turvey	12 0	24 19	...	...	...
Cadia	11 0	...	...	...	...

Notes on the Varieties.

Federation is still holding its own very well further west, but in many places in central Riverina it is dropping out and being replaced by one or two of the newer varieties, such as Waratah and Union.

Bena (Hard Federation x Marshall's No. 3, a natural crossbred) has been giving fair yields in some parts this year, but it is considered a little slow in maturing for the western portions. It is a promising variety, and worthy of further trial.

Huff's Imperial is a club-headed selection of Federation, which probably accounts for it doing very well in the far west.

Union (Federation x Cowra No. 15) has done excellently throughout this season. It yielded the best in the far west and in the central districts it was damaged least by the strong winds in December, while it gave no trouble in harvesting. It seems a strong rival of Federation.

Binya, a new wheat (a selection from Hard Federation), has been disappointing. It did not fill up to expectations, and shelled badly. It will be tried again for another season in the western portions.

Waratah (Purple Straw x Gluyas Early), grew rather rank this season and shelled a fair amount in parts, but the season was abnormal and against it. It has done excellently in the past and has taken the place of Federation in many parts. It is still recommended, and will be included as a standard variety in the plots.

Cargo (Cleveland x L.A.T. x Gilgandra x 9 (F.)). A new variety that should be suitable for the cooler portions, but has not done well in the west.

Canberra (Federation x Volga Barley), gave very fair results at Berrigan. It is a variety that has not been grown to any extent in the Riverina, but should do well in the drier portion. It is very early maturing, its chief fault being its liability to lodge with heavy weather in November or December. Withall, it seems to hold fairly well and to stand combing up unless conditions are very bad.

Turvey is a slow maturing wheat, tall strawed, with a very loosely coupled ear; usually does not yield up to expectations. It shelled badly this season.

Cadia (Cleveland x L.A.T. x Jumbuck x 9 (F.)) is a new wheat which grows rather tall; slow maturing, ripening about the same time as Yandilla King; gave disappointing results this year, but is only recommended for trial in the cooler portions.

The Fertiliser Trials.

Federation was the variety used for these trials at all centres. The following results were obtained:—

Superphosphate.	Coolamon.	Milbrulong.	Berrigan.	Deniliquin	Mathoura.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
45 lb. per acre...	...	...	...	...	28 4
56 lb. ,, ...	20 0	...	28 34	17 0	...
74 lb. ,, ...	...	...	...	...	32 0
84 lb. ,, ...	20 0	25 57	28 51	18 0	...
98 lb. ,, ...	...	...	...	...	31 20
112 lb. ,, ...	19 0	27 48	29 21	15 0	29 20
140 lb. ,, ...	...	21 13	...	...	...

It will be noticed that at several places an increase was obtained up to a certain rate of application, and then as the amount of superphosphate increased the yield decreased.

The rate of seeding with these trials was 75 lb. per acre at Coolamon and Milbrulong, 66 lb. at Deniliquin, 60 lb. at Berrigan, and 58 lb. at Mathoura.

Rate of Seeding Trials.

There was only one rate-of-seeding experiment, and that was in the far west, at Mathoura. The results were as follows:—

Seed per acre.	Yield per acre. bus.	lb.
45 lb.	27	33
58 lb.	28	04
80 lb.	28	16

The amount of superphosphate applied was 45 lb. per acre. It will be noticed that in the case of the very heavy seeding, the increase in yield was not as much as the amount of extra seed sown.

It was thought the amount of superphosphate was on the light side, and it is proposed to continue the trial next season, using more of the fertiliser.

Oat Trials.

Oat plots were sown at two centres. The results were as follows:—

	Coolamon. bus.	Coolamon. lb.	Milbrulong. bus.	Milbrulong. lb.
Algerian	46	20	44	11
Lachlan	57	0	46	14
Buddah	31	0	24	35
Mulga	39	0	35	15
Myall	...		37	0
Belar	...		48	4
Sunrise	...		24	35

The amount of seed sown was 60 lb. per acre at Coolamon, and 55 lb. at Milbrulong; superphosphate at 56 lb. was applied in both cases.

Lachlan stands up well and although rather coarse for hay, yielded the best at Coolamon and second best at Milbrulong. It is not so late as Algerian. Buddah, Belar, Mulga, Myall, and Sunrise are all early maturing varieties which can be sown after the sowing of wheat is completed, and still be ready before the wheat harvest begins. They should be particularly useful in this respect, and in the western portions where the season does not permit successful crops of Algerian.

At Milbrulong, Buddah and Sunrise were not stripped when quite ready, and shelled badly, which accounted for the low yields.

SOUTH-WESTERN DISTRICT.

E. S. CLAYTON, H.D.A., Senior Agricultural Instructor.

The following farmers co-operated with the Department in conducting field experiments in the past season:—

G. C. P. Circuitt, "Uabba," Lake Cargelligo.
P. Corcoran, "Weeroona," Moombooldool.
T. J. Fitzpatrick, "Erin Vale," Warre Warral.
D. and J. Gagie, "Spy Hill," West Wyalong.
G. Gow, "Hughenden," Barellan.
Hobson Bros., "Glenlea," Cunningar.
D. N. Johns, "Wollongough," Ungarie.
H. T. Manning, "Riverstone," Barellan.
M. McCrone, "Bungambil," Mirrool.
R. H. Thackeray, "Wootoona," Young.
T. W. Turner, "Kia Ora," Lake Cargelligo.

The Season.

The rainfall at the various centres was as follows:—

RAINFALL.

Month.	Barellan.		Cunningar.	Lake Cargelligo.		Mirrool.	Moombooldool.	Ungarie.	West Wyalong.	Young.
	G. Gow	H. T. Manning.		G. Circuitt.	T. Turner.					
On the Fallows.										
	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
March	...	...	...	...	...	47	...	...	...	...
April	...	...	...	...	...	17	...	...	...	...
May	536	...	...	...	...	427	...	...	...	...
June	268	...	...	218	...	199	...	...	...	...
July	142	...	...	147	169	155	...	...	...	...
August	165	159	219	74	120	159	172	...	10	201
September ...	52	41	122	12	16	47	41	...	64	130
October ...	39	69	101	30	22	27	47	...	62	100
November ...	54	30	371	140	...	114	99	...	240	350
December ...	9	...	22	75	175	30	32	...	77	15
January ...	21	30	37	45	...	47	68	13	56	245
February ...	...	...	37	...	...	...	...	...	...	47
March	189	214	505	329	334	309	248	370	509	725
April	371	322	291	225	257	444	421	361	302	...
May	...	...	307	...	...	...	...	...	184	329
Total ...	1,846	865	2,012	1,295	1,083	2,022	1,128	744	1,504	2,142
On Growing Crops.										
	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
April	...	...	...	...	...	...	...	...	...	...
May	140	132	...	138	107	127	149	222	...	...
June	199	165	178	228	242	160	223	185	205	169
July	127	149	191	97	50	93	138	46	88	207
August	148	218	203	136	138	134	189	71	152	125
September ...	47	22	269	85	...	45	213	70	205	42
October ...	109	127	143	33	...	77	91	22	41	108
November ...	...	...	38	...	...	...	...	...	5	14
Total ...	770	813	1,022	717	537	636	1,003	616	696	665

Good rains were received in the autumn of 1926; in fact in some centres the rains were so plentiful that the sowing was considerably delayed. The constant showers during March, April, and May, while very acceptable from one point of view, were somewhat of a disadvantage from another. The weather was so showery that it induced a tremendous growth of weeds on the fallows, and although they were cultivated, the weeds in many instances took root again and flourished, so favourable was the season. Many crops were seriously handicapped by this weed growth, which could not in some cases be destroyed prior to sowing the wheat.

At most centres good winter rains were received and crops made excellent growth, except where weeds had not been thoroughly destroyed. There was a remarkable absence of frosts during the early part of the winter, the weather remaining showery and dull most of the time. The mildness of the winter, combined with the dryness of the spring and early summer, caused the wheat to ripen from ten to fourteen days earlier than usual, and in a few instances resulted in some of the grain not filling so well as usual. Most of the crops, however, filled well, and the yields were very satisfactory.

The Plots.

Barellan (G. Gow).—Soil black, self-mulching, heavy clay, similar to the Wimmera soil; ploughed 4½ inches deep in May and ploughed again in September; harrowed down in October, springtooth cultivated in March, harrowed in May, and sown on 6th May; seed, 75 lb.; superphosphate, 56 lb. per acre.

Barellan (H. T. Manning).—Medium textured red loam; ploughed in August, 4 inches deep; springtoothed to the full ploughing depth in March; springtoothed shallow in April and again in May, sown on 8th May; seed, 70 lb.; superphosphate, 84 lb. per acre.

Cunningar.—Light, friable loam; ploughed in August 4½ inches deep; springtoothed to the full ploughing depth in January; springtoothed shallow in March, again in April, and in May; sown on 25th May; seed, 75 lb.; superphosphate, 84 lb. per acre.

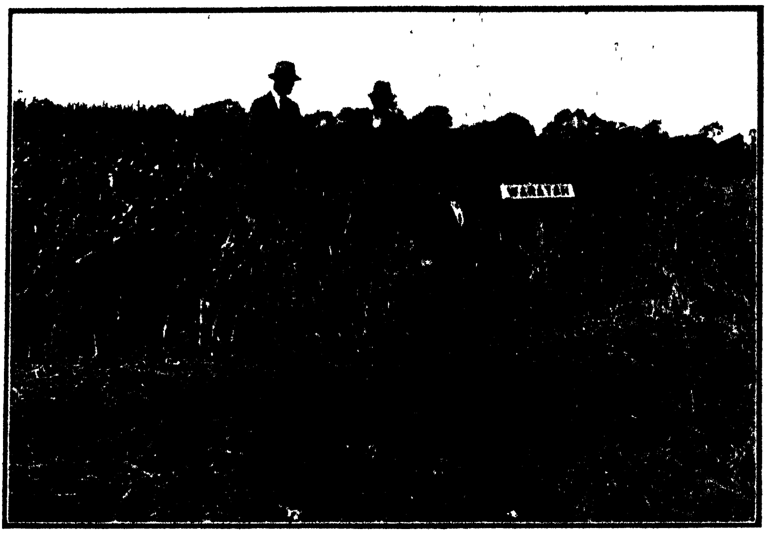
Lake Cargelligo (G. C. P. Circuitt).—Fairly deep, light loam, bright red in colour; ploughed in June, 4 inches deep; springtooth cultivated to the full ploughing depth in September, again shallow in January, harrowed twice in March; sown with a combine on 28th April; seed, 60 lb.; superphosphate, 56 lb.

Lake Cargelligo (T. W. Turner).—Medium textured red loam; ploughed 3½ inches deep in July; springtooth cultivated to the full depth in September, again shallow in November, again in March, and again in April; then harrowed in April prior to sowing; sown 29th April; seed, 60 lb.; superphosphate, 55 lb.

Mirrool.—Moderately strong loam; ploughed with a disc plough in February, 1925, to a depth of 4 inches, scarified in August, again in October, again in December and springtooth cultivated in May; sown 15th May; seed 70 lb.; superphosphate, 84 lb. per acre.

Moombooldool.—Light sandy mallee soil, red in colour; ploughed in July, 3½ inches deep; springtooth cultivated in October, again in January, again in April, harrowed in April, rolled with a spike roller; sown with a combine on 30th April; seed, 60 lb; superphosphate, 112 lb.

Ungarie.—Heavy brown loam (boree country); scarified in January to a depth of 2 inches again in April to a depth of 3 inches; harrowed and scarified again in April; harrowed and sown on 30th April; seed, 60 lb.; superphosphate, 84 lb.



A Heavy-yielding Plot of Waratah.

Warre Warral.—Medium red loam; ploughed in August 4½ inches deep; scarified in December; springtoothed prior to sowing, and sown with a combine on 8th June; seed, 45 lb. (oats); superphosphate, 56 lb. per acre. These plots were interfered with by the excessive growth of crowfoot, and the results were not comparable.

West Wyalong.—Moderately heavy brown loam with a stiff pug sub-soil at a depth of 4 to 5 inches below the surface; ploughed in August, 4 inches deep; springtooth cultivated to the full depth in October; shallow in January, again twice in May. Sown 27th May; seed, 75 lb.; superphosphate, 65 lb.

Young.—Medium to light-brown loam; ploughed in August, 4½ inches deep; scarified in January; disced in March, scarified in June, harrowed prior to sowing. Sown, 15th June; seed, 80 lb.; superphosphate, 56 lb.

VARIETY Trial Yields (per acre).

Variety.	Barellan.		Cunningar.	Lake Cargelligo.		Mirrool.	Moombooldool.	Ungarie.	West Wyalong.	Young.
	G. Gow.	H. Manning.		G. Circuitt.	T. Turner.					
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Baroota Wonder ...	...	...	26 42	...	...	...	...	...	...	21 23
Barwang	...	...	...	...	24 40	...	...	...	...	...
Bena...	27 22	31 32	34 50	36 41	27 0	27 10	...	16 12	19 58	19 21
Binya	...	25 16	...	...	...	...	...	...	...	19 6
Canberra	...	...	...	35 12	32 10	...	...	...	22 38	...
Currawa	...	...	...	...	...	...	15 30	...	...	...
Federation	23 27	30 55	...	38 35	23 30	25 26	15 0	16 44	...	...
Gresley	...	...	...	...	...	...	...	...	17 2	...
Nabawa	...	...	...	...	...	...	...	21 15	...	...
Penny	...	...	...	...	...	...	14 30	...	...	...
Rajah	...	...	...	...	...	...	...	23 58	...	...
Ranee	...	...	...	...	...	...	...	23 38	...	...
Turvey	22 57	...	32 20	...	...	...	11 0	...	...	19 32
Union	...	...	...	35 32	...	30 6	14 0	16 39	19 48	...
Waratah	32 32	...	33 7	33 52	31 15	24 56	14 0	21 41	19 8	...
Yandilla King ...	26 49	...	33 17	...	...	...	...	...	...	16 50

MANURIAL Trial Yields (per acre).

Fertiliser per acre.	Barellan.		Cunningar.	Lake Cargelligo.		Mirrool.	Moombooldool.	Ungarie.	West Wyalong.	Young.
	G. Gow.	H. Manning.		G. Circuitt.	T. Turner.					
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
High grade superphosphate, 45 lb.	...	30 14	...	36 39	...	...	...	...	22 32	...
High grade superphosphate, 67 lb.	...	...	...	38 8	...	...	...	...	22 38	...
Superphosphate, 56 lb.	23 27	27 16	34 4	38 35	23 30	24 27	...	16 56	19 6	16 50
Superphosphate, 84 lb.	24 40	30 55	33 17	37 27	27 10	25 26	...	16 44	24 44	19 58
Superphosphate, 112 lb.	24 26	31 2	...	37 14	28 30	26 9	15 0	16 18	26 16	19 0
Superphosphate, 170 lb.	...	...	...	...	...	...	14 0	...	...	...
Superphosphate, 220 lb.	...	...	...	...	...	...	13 0	...	...	...

Varieties.

Federation, Waratah, Canberra, and Union continue to give excellent yields in the drier portions of the district. Union yielded well at every centre tried, and at Mirrool out-yielded all other varieties. It is a particularly good variety for the dry districts, invariably yields much better than its appearance would indicate, and it withstands boisterous weather admirably. In a season such as 1926, when such severe winds were experienced, these short, sturdy varieties do not suffer to any great extent.

It was observed that Binya, Bena, Canberra, Gresley, and Waratah all shelled to some extent in the severe winds, but it must be said that the winds were so heavy that Yandilla King (which is recognised as a "tough" variety in this respect) shelled a little.

The Western Australian variety Nabawa was tried at Ungarie and yielded satisfactorily. It was examined closely for flag smut, and although every other variety grown in the plots showed the disease to a greater or less extent, this variety was free from it. If it maintains its reputation as a heavy yielding, flag smut resistant variety, it should prove a very acceptable introduction. It will be tested at most centres in this district during the coming season.

An Excellent Hay Crop of Turvey.
Wagga District, 1926 Season.

Manurial Trials.

Manurial trials were conducted at each centre, and the results showed that 56 lb. of superphosphate per acre was the most profitable amount to apply at Cunningar, Lake Cargelligo (light soil) and Ungarie. At Barellan and Young, 84 lb. of superphosphate proved to be the most profitable application. At Lake Cargelligo (heavier loam), West Wyalong, Moombooldool, and Mirrool, 1 cwt. of superphosphate proved best. The tests with high-grade superphosphate were inconclusive.

Diseases.

The dry copper carbonate seed treatment has effectively prevented the occurrence of bunt. This treatment is now in general use and is giving excellent results.

Flag smut was not quite so prevalent as usual, due probably to the early autumn rains. However, it was noticeable on most of the varieties, and seemed to be worse on the lighter soils. Loose smut was not so noticeable as usual, probably on account of the season. Very little foot-rot, take-all, and septoria were to be found.

WESTERN DISTRICT (DUBBO CENTRE.)

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

During 1926 the following farmers co-operated with the Department of Agriculture in conducting cereal experiments :—

S. Reilly, jun., Eurimbla, *via* Cumnock.
Quirk and Everett, "Narrawa," Wellington.
H. Harvey, "Kindalin," Rawsonville, Dubbo.
W. J. Matchett, "Wyohitella," Toongi, *via* Dubbo.
Barry O'Neill, "Baringa," Narromine.
A. Regensburger, Eulomogo, *via* Dubbo.
W. J. Dohnt, "Bonnie Doon," Eumungerie.
H. Griffith, "Glenloth," Eumungerie.
J. Parslow, "Cooya," Gilgandra.
W. G. Law, "Wattle Park," Armatree.
R. Johns, "Ule Wallen," Baradine.
E. Ferguson, "Hill Crest," Coonabarabran.
Corderoy Bros., "Pilton," Purlewaugh.
L. C. J. Broughton, "Berrima," Mendooran.
Lindsay Green, "Denison Farm," Leadville.
Andrew Harper, "Cockle Shell Corner," Toongi.

Comparable results were not obtained at Mendooran, owing to the excessive autumn rains waterlogging the prepared fallow, and necessitating the sowing of the plots on stubble ground ploughed in July. Sown early in August. Good seed was obtained off some varieties.

The Season.

The season was again abnormal. The rainfall aggregate in most centres was nearly sufficient to grow two crops, but owing to uneven distribution did not give the results one would anticipate. Heavy rains in November, 1925, similar to 1924, again saturated the fallows at an inconvenient time in the midst of harvesting operations, consequently many fallows were neglected, became crusted and caked, and grew weeds in abundance. Extremely dry conditions during December, January and February, accompanied by severe hot winds and weather, made it almost impossible and inadvisable to work prepared areas, and difficult to plough stubble land. About mid-March, 1926, abnormal torrential flood rains were experienced over the whole of the west, when from 6 to 11 inches were recorded at all centres. This was followed by substantial falls at frequent intervals during April and May; consequently much ground was kept in a waterlogged state, and could not be cultivated when advisable. This applied particularly to heavy clay loams with a semi-impervious subsoil. Areas of a lighter nature or well drained country, such as is to be found round the Narromine district, allowed the owners to work it up and sow during the rainfall periods in April and May, and all country thus prepared and sown gave excellent results, almost without exception.

June saw a return to drier conditions, and more rapid progress was made in preparing and sowing both fallowed and stubble areas, but, contrary to expectations, one of the driest winters recorded for several years was experienced. Thus all crop sown after mid-June was mostly very poor, and it

would have paid owners better to have put the same work into preparing the ground for next season. Early sowing pays, particularly if the land is fallowed, and it does not matter materially if the spring be dry, as a payable crop is practically ensured. But the results of late sowing are very problematical, and in the majority of cases it would pay the farmer better if the areas prepared were turned into fallow.

Sufficient light falls were experienced during June, July, and August to keep well germinated crops on fallowed land growing nicely, but made for patchy germination and spindly growth on later sown areas. Fair rains during September again assisted well developed crops, but barely revived the late crops, which then suffered a severe set-back by an abnormally dry October and November. From June to November, with very few exceptions, no individual fall of an inch was recorded, consequently it was only the early preparation of the soil and the heavy autumn rains which brought the crops to satisfactory maturity. In spite of the dry winter and spring, many high yields and averages were obtained in all centres, showing the wheat plant to be a hardy one if only given half a chance.

It is pleasing to record that the northern portion of the district (centres such as Baradine, Coonabarabran, Purlewaugh and Leadville), which have recorded poor returns for some years past, produced good to high yields.

Owing to the dry spring, crops ripened rapidly, and harvesting operations commenced much earlier than usual, therefore most of the stripping was completed under excellent harvesting conditions before the advent of rains about Christmas time. The sample of grain taken off was prime, of good colour, and well above standard. Very little bleaching occurred.

RAINFALL.

Locality.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Total for Growing Period.	On Fallow.	Grand Total.
	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
Narromine ...	251	122	93	105	160	28	...	759	1,784	2,543
Dubbo (H. Harvey).	329	124	75	88	175	30	...	821	1,758	2,579
Wellington ...	484	87	109	100	190	44	...	1,014	2,240	3,254
Eurimbla ...	298	126	175	156	165	55	...	975	...	...
Gilgandra ...	263	100	68	69	196	81	...	777	1,942	2,719
Armatree ...	215	87	59	34	81	55	...	531	1,726	2,257
Baradine ...	372	86	104	55	326	...	...	943	1,656	2,599
Leadville ...	115	70	105	83	212	38	...	623	1,936	2,559
Eulomogo ...	224	130	87	118	173	32	...	764	1,717	2,481
Eumungerie ...	534	89	113	51	171	74	...	1,032	...	...
Coonabarabran	469	92	153	31	394	38	...	1,177	2,216	3,393

Cultural Details.

Eurimbla.—Heavy chocolate loam, limestone formation, previous crop wheat, 1924; mouldboard ploughed early September, 4 inches deep; harrowed October; springtoothed late November; disced January to deal with thistles; mouldboard ploughed mid-April, as soil had set hard after heavy

rains; springtoothed late April, again early May. Sheeped continuously. Sown in very wet seed-bed with drill, on 6th to 8th May, using 55 lb. wheat seed, 70 lb. oats, and 60 lb. superphosphate per acre. The ground was too wet on lower portions, causing patchy germination and an excessive growth of weeds, therefore all but four plots were cut for hay.

Wellington.—Red gravelly to chocolate sandy loam, undulating; previous crop, wheat, 1924, no manure; mouldboard ploughed 4 inches deep June-July; springtoothed early September, and harrowed; disced early January, harrowed and cross-harrowed February; springtoothed 20th April; sheeped when necessary. Sown 22nd and 23rd April with drill, using 50 lb. graded copper carbonate treated seed and 50 lb. basic superphosphate per acre. Over 2 inches of rain fell on these plots the day after sowing, causing much erosion, and washing seed from one plot into another on the slope; unfortunately although the results were good, the grain had to be discarded for seed purposes.

Belar Oats on Mr. Barry O'Neill's Farm, Narromine. Yield, 60 bus. 84 lb. per acre.

Dubbo (H. Harvey).—Medium red to gray sandy loam; previous crop, wheat, 1924, no manure; disc ploughed August, 5 inches deep; harrowed and cross harrowed November; disced January, 3 inches deep; springtoothed late March and April, again crossed mid-April; sheeped when necessary. Sown, 29th to 30th April with 56 lb. graded treated seed, and 70 lb. standard superphosphate per acre. Cross harrowed after sowing. As a result of manurial experiments the previous year large amounts of manure were used with marked success. A 200-acre paddock of fallow, of which the plots were part, averaged 37 bushels per acre with superphosphate at from 70 to 90 lb. per acre, and seed at 55 to 65 lb. per acre. Germination and growth were excellent, and yields up to 45½ bushels resulted.

Dubbo (W. J. Matchett).—Heavy red clay loam; previous crop, wheat, 1924, no manure; mouldboard ploughed late September; springtoothed 12th November; disced late January, again mid-May; springtoothed late May, again 14th June, just prior to sowing with drill, on 14th-15th June,

using 56 lb. seed and 70 lb. superphosphate per acre. The soil was wet and cold at sowing time, and it was difficult to deal satisfactory with weed growth. Lower portion of plots boggy and too wet for satisfactory sowing. Germination was fair, but owing to lateness, growth was spindly. Considering these disadvantages, yields were satisfactory.

Narromine.—Medium red loam; previous crop, wheat, 1924, no manure; disc ploughed August, disced January; springtoothed early March; disced April; springtoothed 1st May; sheeped when necessary. Sown 3rd-4th May with 50 lb. seed, and 56 lb. superphosphate per acre. Cross harrowed after sowing. Germination and growth was excellent; the ground was weed free, and moisture content of fallow good, resulting in high average yields.

Turvey Wheat on Mr. Barry O'Neill's Farm, Narromine.
Yield, 40 bus. 19 lb. per acre.

Eulomogo.—Heavy chocolate clay loam; previous crop, wheat; disc ploughed January, 1926, 4 inches deep; sheeped till May; disc ploughed late May, 3 inches deep; harrowed early June, and springtoothed, harrowed again 9th June; heavy autumn rains precluded previous working; sown 10th to 18th June with 75 lb. seed wheat, 60 lb. oats, and 75 to 90 lb. superphosphate per acre. Harrowed after sowing. Results satisfactory, considering late sowing on heavy, wet soil. Florence shelled badly and Bena was caught by frosts.

Gilgandra.—A new farm of lighter soil texture, acquired by Mr. J. Parslow, an experimenter of many years standing; medium to light sandy loam, with heavy clay black patches; mouldboard ploughed September; springtoothed late September; disced late October; springtoothed 10th December, again mid-January, again early April, also 15th April and 4th May (five workings); sheeped continuously. Sown 6th to 7th May, using 50 lb. seed and 50 lb. superphosphate per acre; heavy rain fell on plots the day after sowing, waterlogging patches and causing patchy germination. The plots were cross harrowed after they were up. Yields were excellent off unaffected areas, showing the results of close attention to good farming methods. Owing to extensive heavy waterlogged patches on level country, the yields are hardly comparable.

Armatree.—Medium red clay loam; previous crop, wheat, 1924, with 50 lb. superphosphate; mouldboard ploughed, 4th July; springtoothed, mid-September; harrowed, 17th November; disced, late December, disced and springtoothed mid-January; harrowed, January; springtoothed, late April, again early May; sheeped when necessary. Sown 8th to 9th May with 50 lb. seed and 50 lb. superphosphate per acre. Sowing of plots was not quite completed when 260 points rain fell, waterlogging the heavy soil, causing uneven germination. Growing crop cross harrowed. The ground was weed free, and yields were very satisfactory under the conditions.

Baradine.—Light sandy gray loam; previous crop, wheat, 1924, with 50 lb. superphosphate; disc ploughed 6 inches August; springtoothed late November; disced early February, again early May; sheeped continuously. Sown 27th to 28th May, using 50 lb. seed and 56 lb. superphosphate. Germination was satisfactory, but many wild oats appeared, seriously affecting the growth, and lowering the yields of wheat considerably. Results were poor.

Coonabrabran.—Light gray sandy loam; previous crop, wheat, 1924; trial of oats; mouldboard ploughed early September; disced early January; mouldboard ploughed and disced early May, to kill couch grass and black thistles; harrowed 24th May; sheeped continuously. Sown 24th to 25th May, with 50 lb. oats and 56 lb. superphosphate per acre.

Purlewaugh.—Medium red to light sandy loam; previous crop, wheat, 1924, no manure; disc ploughed late August, 4 inches deep; springtoothed late November; disced mid-March; springtoothed mid-April, again late April, and finally on 25th May; sheeped continuously to check wild oats. Sown 25th to 26th May, with 50 lb. seed and 45 lb. superphosphate per acre. Germination medium only, and yields are light considering satisfactory season.

Leadville.—Medium sandy loam, with deep silts; previous crop, wheat, 1924, with 45 lb. superphosphate; disc ploughed 4 inches deep, December; springtoothed January, and harrowed; springtoothed March, twice during April and three times during May, owing to frequent heavy storms setting ground; Sown 20th to 21st May, using 52 lb. seed and 60 lb. superphosphate per acre. Heavy rain a few days later washed plots badly, affecting ultimate yields.

Toongi.—Red medium sandy loam ; disc ploughed February, again mid-April; springtoothed mid May, again 15th June; sown 16th June with combine using 45 lb. seed oats and 60 lb. superphosphate per acre. Soil very wet and waterlogged in patches, causing uneven germination.

Eumungerie (W. Dohnt).—Upland gray gravelly loam, new ground mouldboard ploughed July-August; springtoothed and harrowed October; disced February; springtoothed May; sown 18th May with 45 lb. seed and 40 lb. high grade superphosphate per acre.

Notes on the Wheat Varieties.

The three standard varieties—*Canberra* (early maturing), *Federation* (mid-season), and *Yandilla King* (late maturing), again proved themselves consistent yielders, and each topped the list in certain centres.

Turvey still maintains its reputation as a high yielding variety if sown early enough under good conditions.

Bena and *Waratah* have now fully established themselves as consistent yielders, and have found favour with a large number of farmers.

Riverina has shown itself to be very highly resistent to flag smut, and the sowing of this variety, together with *Wandilla* and *Nabawa* (a West Australian variety—Bunyip x Gluyas Early) may ultimately prove to be the method by which this serious disease may be controlled.

Of the newer varieties under trial, the following showed promise :—

Duri (Canberra x Hurst's 14)—A brown tip awned early maturing variety, which gave high yields where tried, and was favourably commented on.

Aussie (Federation x Gluyas)—A fairly early maturing variety, with a white bald ear, somewhat tapering; promises to be a sound grain variety, which stands up well to rough conditions.

Bruce.—A white-eared selection from Hard Federation, made by Mr. J. W. Eade, of Euchareena; gave good returns; has a large, square, translucent grain, similar to Hard Federation.

Binya.—A natural cross from Hard Federation; has proved under trial to be a very early maturing wheat; in fact, too early for ordinary conditions. This season, when sown early in May, it was caught by frosts, badly affected with *Septoria* leaf blight, and flag smut, and gave returns much below other varieties under trial on this account.

WHEAT Variety Trials.

Variety.	Narromine.	Dubbo (H. Harvey).	Dubbo (W. J. Matchett).	Wellington.	Eurimbla.	Gilgandra.	Armatree.	Purlewaugh.	Baradine.	Leadville.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Canberra	39 41	45 29	15 51	27 14	27 28	26 45	28 28	22 18	16 19	26 50
Federation	33 53	39 16	15 32	26 28	...	21 3	24 29	...	8 51	28 24
Yandilla King ...	...	37 58	...	30 48	...	22 19	21 47	...	7 7	28 2
Turvey	40 19	...	..	32 30	...	...	23 40	...	...	...
Waratah	36 55	..	..	...	22 26	26 28	26 37	20 42	...	25 51
Bena...	37 0	...	15 44	...	...	22 6	21 53	25 5	11 11	27 38
Binya	19 1	34 52	16 15	20 59	...	..	...	...	...	...
Ranee	35 32	..	.	...	...	...	...	...	...	...
Gresley	...	41 40	...	27 58	27 29	25 21	.	...	9 19	...
Duri	...	38 54	17 49	30 13	...	..	...	...	...	...
Wandilla	.	37 42	..	...	...	...	...	...	...	...
Bruce (J. W. Eade)	..	37 10	...	..	...	...	...	...	...	...
Union	...	36 5	...	...	..	...	23 1	...	...	...
Nabawa	...	21 32	20 50	...	...	26 10	...	...	...	...
Aussie	...	...	16 12	29 41	...	31 44	...	25 51	...	...
Canimbla	...	...	14 38	...	...	...	...	...	...	...
Riverina	..	..	...	27 18	...	..	28 52	...	...	...
Cadia	...	...	..	26 7	...	...	...	...	...	...
Clarendon	...	...	...	...	...	...	22 5	16 28	0 30	...
Currawa	...	...	...	...	...	.	...	21 37	...	...
Florence	...	...	...	...	...	..	...	...	10 10	...
Hard Federation ...	...	...	...	...	...	...	..	...	...	27 6

Diseases.

Fungous diseases of the wheat plant were not troublesome in the plots this season, pointing to the fact that fallowing methods have a great deal to do with keeping them in check. Bunt was not seen, being again effectively controlled by the use of dry copper carbonate. Flag smut was noticed in certain varieties, namely Canberra, Binya, Hard Federation, Turvey, and Waratah, but did no material damage. Loose smut was practically absent this season, but foot-rot (*Helminthosporium*) was more prominent, and caused a fair percentage of damage in many crops.

OAT Variety Trials.

Variety.	Narromine.	Dubbo (H. Harvey).	Dubbo (A. Harper).	Wellington.	Eurimbla.	Gilgandra.	Armatree.	Purlewaugh.	Eumungerie Bureau. Pure Seed (H. Griffith).	Bunninyong-Eulomogo Bureau. Pure Seed (A. Regensburger).
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian	52 29	39 7	14 29	32 12	52 22	17 36	36 16	27 8	22 34	..
Lachlan	60 36	...	22 36	34 4	...	...	...	...	...	..
Belar	60 34	35 19	...	...	52 4	...	45 26	23 31	...	19 11
Buddah	55 0	...	...	38 23	...	...	...	26 5	...	..
Sunrise	...	36 13	17 32	..	...	...	...	26 25	28 36	21 24
Guyra	..	33 32	21 19	33 0	46 35	13 17	39 28	30 1	36 6	24 3
Mulga	...	...	...	34 26	...	19 35	43 1	24 8	24 15	25 27
Myall	...	...	...	...	43 12	...	...	.	.	..

FERTILISER Trials with Canberra Wheat.

Amount of Fertiliser per Acre.	Narromine	Dubbo (H. Harvey).	Dubbo (W. J. Matchett)	Wellington.	Eurimbla.	Gilgandra.	Armatree.	Purlewaugh.	Baradine.	Leadville.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Superphosphate—										
45 lb.	...	..	..	...	...	...	...	22 18	...	...
50 lb.	...	...	...	26 1	...	26 45	28 28	...	...	...
56 lb.	39 41	...	...	...	...	...	...	...	16 19	...
60 lb.	...	...	...	...	27 28	...	...	...	...	26 50
70 lb.	...	45 29	15 51	...	...	...	...	...	...	...
Unmanured .	38 29	43 2	13 44	27 14	17 43	22 57	27 14	18 42	12 18	23 33

FERTILISER trials with High-grade Superphosphate and Basic Superphosphate.

Fertiliser per Acre.	Wellington. (Bena).	Dubbo H. Harvey (Wandilla)	Armatree (Turvey).
	bus. lb.	bus. lb.	bus. lb.
High grade superphosphate—40 lb. ...	......	24 17	......
" " 56 " ...	22 16	......	23 40
" " 80 " ...	......	26 56	......
Basic superphosphate— 56 " ...	34 20	......	......
" " 80 " ...	25 38	......	......
Unmanured	26 50	23 33	22 20

Oat Variety Trials.

Oats for grain were tried out at ten centres, the slower maturing Algerian variety being used as a standard basis for comparison. The results varied considerably from 13 to 60 bushels. Oats are a difficult crop to harvest with a header, and much grain was lost in many instances over the comb, or by the stripping of the plots being delayed too long. Again the early maturing varieties showed to advantage, and in varieties such as Sunrise, Mulga, Belar, Guyra, and Buddah, the farmer has a choice which allows him to sow oats for grain, hay, silage, or green feed after his wheat sowing programme is finished, and still be reasonably sure of obtaining profitable results. The value of growing oats on a farm in conjunction with wheat is gradually becoming recognised.

Pure Seed Wheat Areas.

In conjunction with five branches of the Agricultural Bureau, pure seed plots were again established in order to supply a continuity of seed of the farmers' own choice, and thus tend to improve the general standard of seed used in any given district. The yields obtained and the varieties selected by the Bureau branches in question are shown in the accompanying table.

PURE Seed Wheat Areas.

Variety.	Eumungerie Bureau.	Bunninyong-Eulomogo Bureau.
	bus. lb	bus. lb.
Canberra	28	....
Federation	29	....
Hard Federation	30¼	....
Waratah	26½	23¼
Yandilla King	....	21¼
Bena	....	18¾
Florence	....	18¾

Fertiliser Trials.

A small manurial trial with Canberra was incorporated in all the wheat variety trials. With one exception, profitable increases were obtained, ranging from 1 to 10 bushels. Some soils, namely those of limestone origin, seem to respond in a greater degree to applications of superphosphate; the results of several seasons' tests have proved beyond doubt that the application of superphosphate as an aid to increased yields is profitable on fallowed land, where there is an adequate reserve of moisture stored.

Fertiliser trials were also conducted at Dubbo and Armatree, with varying amounts of both standard and high-grade superphosphate in comparison with no manure, also at Wellington with basic superphosphate on a soil which will not respond to ordinary superphosphate. The basic material, probably on account of its large lime content, seems to act in a soil of ironstone origin, which may be chemically neutralising the effect of the standard manure.

Essentials in Oat Growing.

J. T. PRIDHAM, H.D.A., Plant Breeder.

As with all crops, the first of the essential points in the successful growing of oats is the selection of a good sample of seed. The grain chosen should be plump and well cleaned and threshed, so that it will run freely through the drill without clogging. The threshing is even more important than grading, for a dirty, half-threshed sample causes patchy and uneven sowing. Oats may be graded with a blower or winnower to separate the light and empty kernels. The latter can be utilised for feeding stock, and the heavy grains for seed, so as to ensure a uniform, vigorous stand.

In growing oats in the warmer districts it often pays to get the seed from cooler country, the resultant growth being then taller and more vigorous. For instance, a Trundle grower should, if possible, get seed from Bathurst, Orange, or even Cowra. There is an element of risk in changing seed, however, and unless a grower is sure of his source of supply it is safer to practise plant selection and to raise one's own seed on the farm. An alternative course would be to obtain small supplies of pure seed at regular intervals from one of the Government farms, and to keep the increase as seed for a larger area the following year.

Preparation of the Soil.

Oats are sometimes left to take their chance on unfallowed or poorly prepared soil. Although the crop is hardy and makes a good show under such conditions, the farmer should remember it responds well to good treatment. The roots are not nearly so deep and extensive as those of wheat, but deeper ploughing is recommended than for the latter (storage room for rain being thus provided), together with good cultivation to ensure cool moist root range.

When pulling up an oat plant it will be noticed that the young oat has a far less firm hold of the soil than has the wheat seedling.

The quantity of seed to sow differs with the variety, the climate, the time of sowing, and the soil—least of all with the soil. With a good rainfall oats become coarse if not sown thickly, and as the season advances sowings require to be heavier in order to make up for the lack of stooling. Oats should be sown less thickly for grain than for hay production. Farmers will modify their practice to suit local conditions and experience, but a guide as to quantities may be given. A sowing of 30 lb. for early and 40 lb. for mid-season would be about right for Algerian; and for Guyra and Lachlan, 40 lb. for early, 50 lb. for mid-season, and 60 lb. for late sowings. Algerian should not be sown after mid-season; Mulga and Sunrise (which stool less than the foregoing), should be put in at about 40 to 50 lb. when

sowing early for feeding off, mid-season at 50 to 60 lb., and late at 60 to 80 lb. per acre. These amounts may be varied for different districts and needs, but they are about right for the Central Tableland, and on clean ground.

Pickling seed is not usually necessary for the varieties quoted, but if late oats, such as White Tartarian, are grown, it is advisable to pickle for smut with formalin, soaking the seed for five minutes in a 1 to 400 solution.

Superphosphate is the only fertiliser found necessary for the oat crop. Special oat manures, except on unusually poor land, are not in our experience required for New South Wales conditions.

The Sowing Depth.

Regarding the depth to sow, it must be remembered that oats take a little more moisture to germinate than wheat, and while 2 inches is a good depth in a moist seed bed, they should be put down 3 inches in a dry seed bed, provided the soil is moist at that depth. If the soil is dry to a depth of 3 or 4 inches it would be wiser to plant 2 inches deep and wait for rain. Although wild oats will come up from a depth of 4 to 5 inches, the plants are not so strong as if they had germinated nearer the surface.

We may group varieties of oats according to their stooling or tillering capacity, and with this their period of maturity coincides. Algerian is the thickest and one of the latest of the varieties, and Buddah is the earliest to ripen and the smallest in number of stalks produced.

Although Algerian is a good drought-resister, a plump sample of grain cannot be expected under dry conditions. On the other hand, Lachlan or Guyra will yield a good plump grain, though the bulk of hay produced may not be quite equal to that of Algerian. Should a farmer's land grow too much straw and the crops go down easily, they should be fed off, or a variety should be grown like Lachlan, which will safely stand until stripped or cut. Should Algerian grow rather too short to make good sheaves in a dry district, Mulga is recommended in its stead. Algerian and Sunrise are excellent oats for feeding off; the other varieties feed off well, but Guyra and Lachlan are perhaps more especially adapted for grain, while Mulga is a good general-purpose oat for late sowing.

No variety of oats can be relied upon to stand long when the grain is ripe. The crop soon begins to shatter, and bushels or even bags to the acre are lost if stripping is delayed in windy weather. Oats may be stripped a little greener than wheat; the dry grains will take up the moisture of the immature ones. The main stalks should have their grain ripe when the crop is stripped; lower heads may be a trifle green, but there is no need to wait for them to ripen. If stripping a considerable area of oats, it is wise to grow an early and a mid-season sort and to make two or three sowings, so that the losses at harvest time may be minimised.

Varieties Recommended for Various Districts.

The varieties recommended by the Department for the various portions of the State are as follows:—

North Coast.—Algerian (for grazing), Sunrise, Mulga.

South Coast.—Algerian, Guyra, Sunrise, Mulga, Myall.

Central Tableland.—Algerian, Guyra, Lachlan, Mulga.

Northern Tableland.—Reid, White Tartarian, Algerian, Guyra.

Southern Tableland.—Algerian, Guyra, Sunrise, Mulga, Myall.

Monaro.—White Tartarian, Algerian, Mulga.

South-western Slopes and Riverina.—Algerian, Lachlan, Sunrise, Belar, Mulga.

Central-western Slopes.—Algerian, Lachlan, Guyra, Sunrise, Mulga.

North-western Slopes.—Algerian, Lachlan, Guyra, Sunrise, Mulga.

Under Irrigation.—Algerian, Guyra, Sunrise, Mulga.

Western Plains.—Sunrise, Mulga.

Harvesting.

The harvester is not at all an ideal machine, but it is perhaps the best where sheep are kept and turned in when the crop is off. It is estimated that you cannot get more than 60 bushels per acre of grain with the stripper or harvester, whereas by cutting and threshing, up to 80 bushels per acre can be bagged from a heavy crop. In one instance in the season just past 57 bushels per acre of Lachlan were stripped.

For hay purposes, oats should be left till nearly ripe, and not cut on the green side as in the case of wheat. In fact, some farmers have had disappointments with oaten hay on this account, for when cut green it has a bitter flavour that is disliked by stock and that makes it unsaleable on the market.

The mode of harvesting will partly depend on the season, but chiefly on the number of sheep kept by the farmer. If the number is negligible the crop will be cut for hay or stripped for grain and sold off the farm. This, of course, means a drain on the fertility of the soil which will have to be faced sooner or later, as wheat-growers have found to their cost. Where sheep are relied upon for about half the income and wheat for the other half, the crop will probably be grazed once and the oats eventually cut for hay and a portion stripped to provide seed.

If the grower is making sheep the main issue, the handling of the crop might well take the following form: Graze off successive sowings; turn a proportion of the crop into pit silage, and strip a section for grain, leaving an area for hay sufficient to feed the working horses. In this way the crop is sacrificed for the benefit of the stock.

Feeding Off.

Feeding off crops is always a safe practice; it reduces the risk of lodging, lessens the damage from rust should the disease appear, and if done judiciously, will always pay the farmer who has stock. Sunrise and Mulga give a good plump sample of grain after feeding off in an average season.

As Mr. Colebatch, of Roseworthy College, South Australia, says: "Barley pasturage, while very prolific and serviceable in autumn and winter, thins out in the spring, whereas oats steadily improve in the colder weather and strengthen into a thick mass of forage which lasts through the spring and early summer."

Oats as the Staple Sheep Feed.

While a variety of feed, such as natural pasture, lucerne, and field peas, is always desirable, we cannot deny that oats are the most useful fodder for the man with a relatively small property. If sowing is started in March and continued till the end of April the sheep would be supplied with a green picking in May, provided an early variety, such as Sunrise, Buddah, or Mulga, is sown and the soil had sufficient moisture at the start.

The year's feed bill might be worked out as follows:—

December to April.—Grazing stubbles, supplemented with grain if necessary.

May to August.—The grazing of the green crop, subdivision fences being necessary for this to be done economically.

September, October, and November.—The paddocks shut up for hay and grain crops, the sheep having access to silage and grain to top off the lambs.

Grazing should be the main feature, crops being continuously fed off at intervals till the soil is ploughed. In this way the stock-carrying capacity of the farm could be very greatly increased.

A few remarks may be quoted from a very complete report on the food values of oats and other fodders by Mr. Jefferis, the South Australian Agricultural Chemist, and his assistant, Mr. Piper: "The authors of this paper are strongly of the opinion that insufficient stress is laid on the importance of proteins . . . the computation of food values by the starch equivalent must only have a limited application, and is no sure guide in respect to growing and breeding stock. The practice of hand feeding is in its infancy here. . . . There are, however, a number of sheep-farmers who are finding it profitable to hand feed ewes during certain seasons, and undoubtedly this system will become general in time. During the months of May to August in many districts natural pasture is scarce, and this is the particular period when ewes need the best of food for lambing and weaning, lambs for fattening, and all sheep for production of wool, which particularly at this time drains the resources of the animal. Our natural pastures, though containing a sufficiency of starch and fat, are fibrous. Consequently the stomach is overloaded, unnecessary bulk must be carried, and the energy used in digestion is considerable."

Palatability trials with oat varieties seem to indicate that Mulga, Guyra, and Sunrise are most liked by sheep, but Algerian finds less favour. Symptoms of poisoning are reported in good seasons, particularly where sheep are put in to feed off crops, but this also occurs on natural pastures with very succulent herbage and grass. Care must be taken not to put hungry sheep on, and to watch for signs of sickness. At certain stages the growth is more dangerous to stock than others, but with judicious changes of paddock and feed the trouble can be fairly well controlled.

Oaten straw has a higher feeding value than wheaten, and if a crop is cut for hay or chaff a good practice is to cart the sheaves direct to a press and stack the baled hay in a shed. Mice will not work in tightly baled hay as they would in an ordinary stack.

Supplementary Remarks.

A cheap tank for storage of grain has been erected by Mr. W. W. Watson, of Tichborne, near Parkes. The material, mostly galvanised iron, cost £22 10s. on the ground, and the silo was erected by farm labour, on a pine stand a foot or two above soil level. It held 300 bags of oat grain in perfect condition for at least fifteen months. Other farmers are going in for silos as a protection from mice, insects, and weather.

The Reid and White Tartarian oats are moderate stooling varieties, rust-resistant, but much later than Algerian. They are known as "side" oats, the grains hanging to one side of the stalk like a horse's mane, as distinguished from "tree" oats, which have a spreading panicle. They are the only varieties adapted for spring sowing in the cold districts of New England and the Monaro, and they are rather an exception to the rule that late ripening oats stool most. A heavy seeding is general in these cold districts, up to 2 bushels per acre being found necessary. Other varieties are sown in autumn.

The Wild Oat and the True Oat.

It has been sometimes stated that the Algerian and other sorts revert in time to the wild oat. We certainly do find seeds more or less hairy and of a darker tint than usual (the Algerian has a few hairs or fine bristles at the foot of the grain), but the true wild oat, besides being of a totally different species, is very hairy, with a coarse awn, and a horse-shoe shaped mark at the lower point of the seed, which is peculiar to it. Plants with grain as black as any wild oat may be found in cultivated oats, but they are not so hairy as the wild oat and lack the characteristic mark at the butt end.

These false wild oats will be found particularly in Sunrise and its derivatives, Mulga and Buddah.

Farmers need have no fear of cultivated oats degenerating to the wild type; any variety will show variations in the colour of the seed, presence of awn, fineness of awn, and number and length of basal hairs, but we have not seen the extreme departure suggested. These variations will increase, and the sample will become badly mixed unless the farmer grows stud seed, selects his own, or else periodically renews his oats from an experiment farm or some reliable grower.

Where an area not very extensive is to be sown, a good way of preparing a sample of seed that is not too well threshed, *i.e.*, contains too much tail or oats not separated, is as follows:—Put 1 bushel of seed in a bag at a time, choosing hot weather or a warm day; tie the mouth and beat the bag a few seconds with a flail or heavy stick. When sufficient seed has been so treated, put it through a blower or winnower, and a good sample for sowing will result.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner.	Address	Breed.	Number tested.	Expiry date of this certification.
Department of Education ..	Yanco Agricultural High School.	......	26	12 Jan., 1928
Walter Burke	Bellefaire Stud Farm, Appin	Jersey..	36	19 March, 1927.
Department of Education ...	Gosford Farm Homes	......	32	16 April, 1927.
H. W. Burton Bradley ...	Sherwood Farm, Moorland.	Jersey..	71	21 May, 1927.
William Thompson Masonic Schools.	Baulkham Hills ..	.. ...	33	15 June, 1927.
Department of Education ...	Mittagong Farm Homes.	......	33	7 July, 1927.
Hygienic Dairy Company ...	Glenfield Farm, Casula, Liverpool.	......	113	15 Sept., 1927.
Lunacy Department ...	Morisset Mental Hospital.	......	14	18 Oct., 1927.
Department of Education ...	May Villa Homes ...	......	6	3 Nov., 1927.
Do do ...	Eastwood Home	......	10	3 Nov., 1927.
Do do ...	Hurlstone Agricultural High School.	......	47	4 Nov., 1927.
Lunacy Department ...	Rydalmere Mental Hospital.	......	61	23 Nov., 1927.
A. E. Collins...	Hazelhurst Dairy, Bowral.	......	10	6 Dec., 1927.
Miss Brennan	Arrankamp, Bowral	......	27	7 Dec., 1927.
Lunacy Department ...	Callan Park Mental Hospital.	......	26	15 Dec., 1927.
Chaffey Bros.	"Lilydale," Glen Innes.	......	15	25 Jan., 1928.
Lunacy Department ...	Kenmore Mental Hospital.	... ..	99	1 Feb., 1928.

—MAX HENRY, Chief Veterinary Surgeon.

WHEN FEEDING HORSES.

A COMMON cause of repeated slight attacks of colic in horses, especially with working horses on farms, is the dry, rough, coarse, and indigestible nature of the herbage found in many paddocks. Too much coarse food prevents digestion by reason of its irritative effect on the stomach. A certain amount of bulky fodder increases the digestibility of the more concentrated foods, such as oats, but too great a quantity of such food greatly weakens the power to digest. Farm horses, as a rule, eat far too much rough bulky fodder, and many suffer in consequence. A working farm horse does not require more than 12 lb. of hay a day, and the rest of the ration should be made up of grain, such as oats, or half oats and maize.

Crop-growing Competitions, 1926.

Further Extracts from Judges' Reports.

NORTH WESTERN DISTRICT.

C. McCAULEY, Agricultural Instructor.

SEVENTY-FIVE crops were inspected in connection with crop competitions in this district, competitions being conducted by the Gunnedah, Inverell, Narrabri, and Moree associations, and the Wynella, Willala, Dunnadee Creek, Willowdale, Nandewar, and Wee Waa Agricultural Bureau branches.

The Season.

The season was exceptionally dry between September, 1925, and March, 1926. Good rains fell during March between Bellata and Curlewis. This enabled the farmers to work their land and obtain a good seed bed. The districts between Moree and Inverell failed to get this rain. Good rains fell during April and May, which caused a good germination and gave the plants a good start. The totals for June and July were far below the average. Dry weather accompanied by heavy frosts was experienced during August and September; this caused a serious check to the growth of the plant. Hot dry weather accompanied by heavy winds set in during October, and caused the plants to ripen prematurely, but a good sample of grain was obtained.

Fallowing.

This season and the previous one have definitely proved that if the north-western farmers would only fallow their land, crop failures would be very few. It was noticed during the tour around that the only heavy crops were on fallow land; the others were only medium to light or practically failures. A number of these farmers are trying to sow too large an area. It would be better to sow less and farm better, thus eliminating failures and filling more bags.

Some heavy yields were obtained from fallow in the dry Inverell and Pallamallawa districts. These crops were clean, particularly free of disease, and were dense and well headed, but contained a number of low thin patches, due to the dry season.

In every case in the Gunnedah, Boggabri, Narrabri, and Wee Waa districts where a suitable variety was sown on either short summer or winter fallow the yields were above expectations, but where a variety—suitable or unsuitable—was sown on unfallowed land, or sown too late, the yields were disappointing.

The grain as a whole was an excellent sample, and the seed used was up to the standard (except in a few cases), this being a great contrast to the rubbish sown two years previously.

The majority of the crops were infected with foot-rot and flag smut. There was very little bunt to be seen, due to the general use of dry copper carbonate.

The Leading Crops.

Gunnedah Competition.—Mr. J. Cavanagh, of Curlewis, secured first place in this competition with the variety Clarendon. The crop was sown on a black loam that was gravelly in parts. The land was disced in December, 1925, and cultivated in January and February. Sheep were run on the fallow. The seed, after treatment with dry copper carbonate, was sown with a combine drill on 12th May, 1926. A dense even crop, except for a few lodged patches, was the result. The heads were well filled and the grain was plump. There were few strangers. The crop was free of weeds and also free from diseases, except for a little rust.

Mr. C. Hathway, of Curlewis, and Mr. Peachy, of Kelvin, Gunnedah, secured equal points for second place in the competition. Mr. Hathway's crop of Waratah was sown on 30th April, 1926, with a combine drill at the rate of 37 lb. per acre. The soil was a chocolate loam, which had been ploughed in December, cultivated in April, and harrowed in May. Sheep were run on the fallow. Before sowing, the seed was treated with dry copper carbonate.

Mr. Peachy's crop of Rymer was sown on chocolate loam early in May at the rate of 50 lb. per acre. The cultivation consisted of a well worked short summer fallow. The crop was dense and well headed, but there was a fair amount of foot-rot, and traces of bunt, flag smut, and loose smut.

Wee Waa Competition.—First place was secured by Mr. T. Underwood with the varieties Florence and Canberra, which were sown on a black, self-mulching loam that had been first cultivated in February and from then on once a month until sowing. The seed was treated with dry copper carbonate and sown on 15th June, 1926, at the rate of 55 lb. per acre. An even crop resulted, containing a few strangers, and also showing evidence of foot-rot and bunt.

Mr. N. W. Webb secured second place with a crop of Hard Federation, and Mr. M. A. Mackaness third place with the same variety. Mr. Webb's red loam was ploughed in January and kept well stocked with sheep. The seed was treated with dry copper carbonate and sown on 5th May, 1926, at the rate of 54 lb. per acre.

Mr. Mackaness ploughed his red sandy loam in March, and cultivated it in April. Sheep were run on the fallow. The seed was treated with bluestone and sown on 15th May, 1926, at the rate of 40 lb. per acre.

Narrabri Competition.—Mr. R. W. McWilliams, of Turrawan, secured first place with a crop of Waratah. The land—red sandy loam—was ploughed at the end of July, 1925, harrowed in September, stock were run on the land

during December, and it was cultivated in March. The seed was treated with dry copper carbonate before being sown at the end of April at the rate of 50 lb. per acre. Except for a few low heads, the crop was well headed. A little foot-rot and flag smut were present. Second and third places, respectively, in this competition were secured by Mr. C. G. Croaker, of Edgeroi, with Yandilla King, Waratah, and Federation varieties, and Mr. R. C. Tucker with the variety Cleveland.

Moree Competition.—Waratah was the variety sown by the two leading competitors in this district. The leading crop was that of Messrs. Cosh Bros., of Pallamallawa, which was sown on a chocolate loam that had been ploughed in March, 1925, and then skim-ploughed and cultivated three times, and also harrowed three times. Sheep were run on the fallow. The seed of both leading crops was treated with dry copper carbonate, and in in each case sown at the rate of 60 lb. per acre. Messrs. Cosh Bros. sowed on 18th May, one-half of the crop being manured with superphosphate at the rate of 45 lb. per acre, the other half being left unmanured. There was no noticeable difference between the manured and unmanured sections of the crop. Messrs. Tonkin Bros., who secured second place, put their crop in on 21st April, 1926. Foot-rot and black oats were present in both the leading crops, while a little leaf rust was noticeable in Messrs. Cosh Bros.' crop.

Inverell Competition.—The first two places in this competition were also secured by Waratah, Messrs. Waddell Bros., of Oakwood, being placed first and Mr. S. A. McCarthy, second. Mr. H. W. Pietsch, of Nullamanna, secured third place with the variety Queen Fan.

Messrs. Waddell Bros. ploughed their land—a heavy black loam—in February, and cultivated in April and May. The seed was treated with dry copper carbonate and sown on 29th May, 1926 at the rate of 50 lb. per acre. The crop was extra heavy, being very well headed. A little flag smut, foot-rot, black oats, and a few strangers were present. Mr. McCarthy's crop was also sown on a heavy black soil. The land was ploughed in June, 1925, and harrowed twice. The seed, after treatment with bluestone, was ploughed in during May, 1926, at the rate of 58 lb. per acre. The crop was dense and even, containing some black oats, foot-rot, and flag smut. The heads were well filled and the grain plump. The variety Queen Fan, with which Mr. H. W. Pietsch secured third place in the competition, was sown on a chocolate loam at the end of May at the rate of 48 lb. per acre after being treated with formalin. The land had been ploughed in March, cultivated twice and harrowed twice. The crop was well headed and dense, with some uneven, dried up patches, and contained a number of strangers and some black oats.

Nandewar and Willowdale Competition.—Mr. H. D. Gallagher secured first place in this competition with the varieties Canberra and Clarendon, Messrs. Watkin Bros. and W. K. Campbell securing second and third

places respectively with the variety Canberra. Mr. H. D. Gallagher's soil is a sandy loam. It was ploughed in December and kept well worked until sowing time. Sheep were run on the fallow. The seed was treated with dry copper carbonate, and sown on 17th May, 1926, at the rate of 40 lb. per acre. The crop was dense, even, well-headed, and clean, except for some black oats and a few strangers. A little foot-rot was also present. Messrs. Watkin Bros. ploughed their land—a black to red, stoney, self-mulching soil—in December, harrowed in February, and cultivated in March. The seed was treated with dry copper carbonate and sown on 9th May, 1926, at the rate of 45 lb. per acre. The crop was very clean and dense, but was badly lodged in places. It was free from disease, except for a little rust.

Wynella, Willala, and Dunnadee Creek Competition.—Mr. C. J. Evans, of Boggabri, was placed first in this competition, and Messrs. Clark Bros. second; both competitors sowing the variety Waratah. Mr. J. Haire was third with the variety Canberra. The two leading crops were sown on red loam, and cultivation and seeding methods were very similar in both cases, except that the leading crop was sown ten days later than the second crop, and the seeding was heavier. Mr. C. J. Evans ploughed his land in December, and cultivated it in January and March, 1926. The seed was treated with dry copper carbonate and sown on 25th April, 1926, at the rate of 52 lb. per acre. The crop was very dense and well headed, but it lodged in patches and contained a few strangers. Black oats, thistles, and a little rust and flag smut were present. Messrs. Clark Bros. seeded their crop at the rate of 45 lb. per acre, the yield being not as good as that which secured first place.

RIVERINA DISTRICT.

G. C. BARTLETT, H.D.A., Agricultural Instructor.

Seven competitions were judged in southern and south-western Riverina, embracing the Coolamon (26 entries), Narrandera (22 entries), Lockhart (14 entries), Brookdale (7 entries), Oakland (13 entries), Corowa (30 entries), and Henty (16 entries) districts. The total number of entries in the seven competitions was 128.

Soils.

The soils of Coolamon district met with were mostly good red loams of mixed pine and box country, while one or two were of a heavier nature and a few were light sandy loams.

Those of Narrandera varied considerably from red loams to clay loams of a heavier nature, heavy red and chocolate plain country, dark chocolate plain country inclined towards self-mulching, heavy red loams splashed with grey crab holes, and one or two light red sandy loams. Most of these soils require different workings to the method of fallowing laid down as a guide for typical red loams.

The soils around Lockhart are mostly of the good red loamy nature with one or two of a light sandy loam, while further out at Brookdale many soils of a heavier clay loam nature are met with, as well as numerous patches of mixed red and grey or black country, some of which is inclined to be self-mulching. In the district of Oaklands the soils are also of a very mixed nature. On gently undulating country, timbered with a mixture of pine and box, good red loams are seen, which run quickly to heavy clay loams on the flats and very sandy loams on the pine ridges. Others again are a mixture of red and grey, the grey being of granite origin. Some of these soils are very tricky to work.

The soils of Corowa are mostly of a darker and heavier nature, inclined to be silty and will readily run together and set when worked with the disc. Some of these soils on the plains are of a very heavy clayey nature and it is a problem to get them broken down. The use of the disc at a certain period after rain seemed to be the only effective means, but this season some very good work in this respect was seen being done by a heavy, triangular, spiked implement made of iron and called a " smoodger." This was effectively breaking down the clayey clods without throwing the fine earth on top (as does the disc) the action being more like that of the harrow. It was doing the work very effectively and leaving this class of country in fairly good order. As may be expected it is rather a heavy class of implement to pull. It is not intended to convey the impression that all the soils are like this. There are a good many nice red loams scattered through the district and the darker soils of a silty nature are excellent wheat soils if worked correctly.

The soils in the Henty district are mostly red and chocolate loams, the lastmentioned being on the fine side and inclined to run together if worked too much. West of Henty, towards Munyabla and Pleasant Hills (which districts were embraced in the Henty competition) the country becomes hilly and the timber more of a general mixture of box and pine and the soils are more of a good red loam.

The Season.

A rather dry summer was experienced, which prevented the satisfactory working of the fallows, but retarded the germination of wild oats and weeds. Copious rains fell in April which rendered seeding difficult. In that month 4 inches and over fell in five of the seven districts inspected. At Henty and Munyabla 5½ inches fell in April, being the wettest seeding month experienced for twenty-five years. This was followed by continuous rains throughout the winter, rendering the after-cultivation of the land impracticable. The winter was mild and consequently most of the crops grew rather rank and could not be fed off on account of the wet and boggy nature of the paddocks. Due to seasonal conditions, the winter blight known as wheat leaf blight

(*Septoria tritici*) developed considerably in some districts, especially in those crops in the Coolamon district where heavy seeding was practised with late maturing varieties. This weakened the straw somewhat and was indirectly the cause of a good deal of lodging with the heavy winds later in the season.

Cultivation.

Rapid changes in cultural methods are being noticed. While the disc is still used a good deal, in many cases the scarifier is taking its place. Farmers are rapidly realising the importance of working the fallow more frequently and the importance of early ploughing. At Oaklands and Henty the fallows were mostly only worked once or twice and the disc was relied on to a great extent to cut out the weeds. Most of these fallows were ploughed rather late. At Narrandera the fallows, on the whole, were worked a little more frequently, the disc being still used here a good deal. It is considered that on most of the soils in the Oaklands, Henty, and Narrandera districts it would be wise to withhold the use of the disc as much as possible and substitute therefor earlier workings and the use of the scarifier and harrows for the summer workings. The disc has a tendency to throw the lumps under and cover them with the fine soil, which creates pockets and makes an unsatisfactory seed-bed, as it drys out readily and the top quickly sets, which causes a loss of moisture by capillarity in the early part of the season, and later on frequently results in a partially choked crop.

The first three placed crops in the Coolamon combined competition were all summer fallowed, followed by an early winter mouldboard ploughing in June, and were worked five or six times with the springtooth and harrows after ploughing and before sowing.

The first three placed crops in the Lockhart competition were ploughed fairly early—June, July, and August. The first had six workings, the second seven workings, and the third four workings after ploughing and before seeding. The first and third, in addition, were sown with the combine. Only one of these six crops was disc worked, the implements used being the springtooth, harrow, and scarifier. Early ploughing with the mouldboard plough was very much in evidence. This practice has been advocated for some time, and it is now rapidly gaining favour.

Best results are obtained by giving the fallow a thorough early spring-toothing, say, towards the end of September, going pretty well to the ploughing depth. The scarifier is an excellent implement with which to carry out the later summer operations, for cutting out the weeds, keeping an even depth of mulch, and levelling the seed bed. On those soils which are inclined to run together or on sandy loams there is less likelihood of pulverising the surface soil. If the ploughing has been done early it will give sufficient time for the rubbish to decompose and will permit of deep early combing with the springtooth.

Summer Fallowing.

Summer fallowing is a practice that is now receiving some attention, but while most farmers have commenced well with a good summer fallow, they have neglected to work the fallow after ploughing, and the results have not been as good as expected.

Summer fallowing at least a portion of the farm each season is a practice that can be strongly recommended. If preceded by a good burn it will destroy many fungus diseases and wild oats. It also allows the autumn rain to penetrate the soil and generally puts the land into better order for early ploughing.

Pickling.

The dry copper carbonate method of pickling has increased in favour remarkably this last twelve months, and most of the minor difficulties about which complaints were made the year before seem to have been overcome. One crop of Penny wheat was inspected, the seed of which had been pickled with the dry method and held over twelve months before being sown. The germination of this crop was excellent.

Rates of Seeding and Manuring.

The rate of seeding varied considerably, and, generally, was inclined to be on the heavy side, running to 90 lb. per acre in some cases in the Coolamon, Narrandera, and Henty districts, and as low as 50 lb. at Oaklands. At Brookdale a seeding of 60 lb per acre was favoured, although with the early maturing varieties here it is advisable to try a heavier seeding of 70 to 75 lb. per acre.

The rate of manuring also varied very considerably, as little as 35 lb. per acre being used in one instance, while in some cases 120 lb. per acre was used. Every crop of the 128 judged was manured with superphosphate, most of the farmers using the high-grade (22 per cent.) article. The combine drill is also rapidly gaining in favour in the Riverina district, and seems to be giving every satisfaction.

Diseases.

Foot-rot, take-all, and flag smut were rather prevalent in the Riverina district this year, and it was estimated that these three diseases lowered the yield by 6 per cent, or 2 bushels in every 30 bushels. The methods recommended for dealing with these diseases mostly consist of obtaining a good stubble burn, followed by summer cultivation and oats, and then a well-worked fallow before the next wheat crop. Some farmers do not recognise the danger of feeding farm horses on disease-infected chaff, and then using the horses in working the fallows, while others will run sheep on disease-infected stubble and allow the same sheep ready access to the clean fallow paddocks. The sheep should be run into a grass paddock for two or three days after coming off the stubble and before being put on to the fallows.

The dry working of the fallows has been discouraged for some time, mainly on account of the risk of spreading foot-rot and take-all patches, and of transferring these diseases from one paddock to another.

Very little bunt (or ball smut) was seen, and none was noticed in any crop that had been thoroughly pickled with the dry method. Only the usual small amount of loose smut was present. As the Riverina usually has rather warm weather at flowering time, and the flowering and setting usually takes place quickly (generally only occupying two or three days), the chances of infection with this fungus are minimised, and it is not yet regarded as a serious disease. The infection was noticed to be much heavier in crops the seed of which had come from Victoria. Remedial measures are difficult, and farmers are advised to obtain their seed from sources that are as free from the disease as possible.

Rust and mildew was not present to any extent worth mentioning, and the leaf blight (*Septoria tritici*) has already been mentioned.

Varieties.

The following table gives particulars of awards gained by different varieties in the competition. Only the varieties which gained places are shown :—

Variety.	No. of blocks entered.	Firsts.	Seconds.	Thirds.
Waratah	45	4	4	2
Turvey	28	3	2	3
Federation	25	...	1	1
Yandilla King	14	1	1	...
Bomen	6	1	...	1
Canberra	2	1	...	...
Sangar's Prolific ...	1	...	...	1

Waratah was easily the most popular variety. The way this comparatively new variety has come into prominence in the Riverina district is remarkable. In many parts this variety is taking the place of Federation, but the latter variety is still favoured in the drier portions of the district. Turvey was a popular variety for competition purposes this season. Canberra is a variety of which there is not much grown, but it should do well in the drier portions of the district. Yandilla, where sown early, did well in the eastern portion of the district.

IMPORTANT TO STOCKOWNERS.

THE stockowner should recognise the value of shade and shelter. A little rough hill on the property, covered with stunted gum trees, is worth more to the farmer as it stands for shelter purposes than the small amount of grass it will grow should he decide to have it rung. To settlers in naturally clear country, judicious planting is a necessity. Some of our native trees lend themselves for shelter purposes admirably, while some species from other parts of the world adapt themselves to the same purpose.

The time for tree planting is approaching. The subject is among the many concerning which free literature is available from the Department.

Farmers' Experiment Plots.

Winter Fodder Trials.

Lower North Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

EXPERIMENTS with winter fodders were conducted on the undermentioned farms during the season 1926 :—

E. A. Ducat, Timagog, Macleay River.
H. T. Wheeldon, Gladstone, Macleay River.
F. Waters, East Kempsey, Macleay River.
A. R. Longworth, Ghinni, Manning River.
J. P. Mooney, Dumaresq Island, Manning River.
G. Levick, Taree Estate, Manning River.
A. C. McLeod, Tinonee, Manning River.
R. Richardson, Mondrook, Manning River.
C. Shields, Mt. George, Manning River.
J. J. Milligan, Bulby Brush, Manning River.
G. A. Paterson, Bulby Brush, Manning River.
Alex. Smith, Bandon Grove, Chichester.
J. Richards, Bulahdelah, Karuah.
S. Ebbeck, Vacy, Paterson River.
W. Smith, Paterson, Paterson River.

The Season.

Weather conditions were generally unfavourable throughout the district. During the late summer months very dry and hot weather prevailed. This was followed immediately by a long wet period, more especially in the central and northern portions of the district. Preparatory cultural operations were in consequence considerably hampered, most of the sowings being made on plots which had had only one ploughing and mostly late. In several instances the germination was weakened by further heavy rainfalls. During July further general rains were experienced, and some abnormally unseasonable days, the thermometer in the central and northern parts registering 80 degrees. Frosts were entirely absent in these portions, but they were recorded in southern parts. These warmish conditions continued throughout August and September, which months were unusually dry. It was chiefly through these causes that rust was prevalent earlier than usual, and more especially in the central and northern portions. Oat crops were badly infested.

RAINFALL.

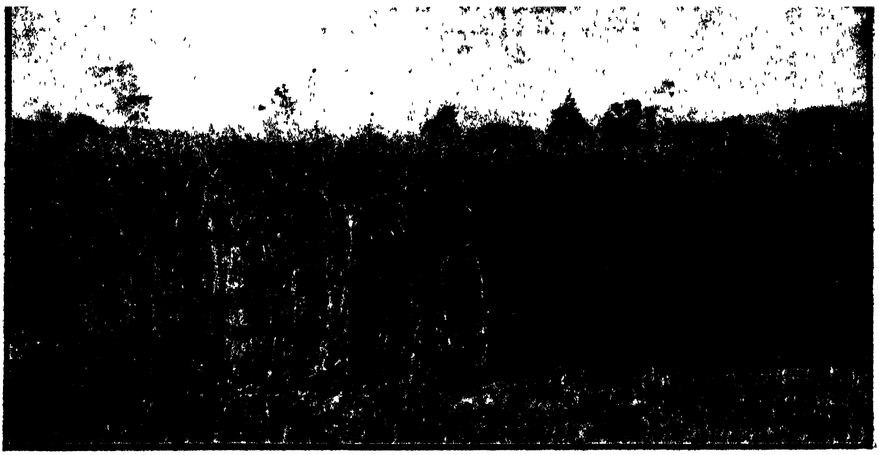
	Kempsey.	Taree.	Bulby.	Mt. George.	Paterson.
1926.	Points.	Points.	Points.	Points.	Points.
March	407	717	776	......	1,087
April	222	418	237	......	471
May	290	562	473	279	275
June	376	293	119	199	230
July	536	636	303	368	590
August	97	154	84	104	100

The Plots.

Vacy.—Soil of a loamy nature; cropped many years previously with a variety of crops; land twice ploughed after sorghum. Germination was good; the crops grew luxuriantly after July rains and were the best over the series. All the oat plots yielded splendidly.

Bulahdelah.—Medium second-class land, which had grown winter fodder plots previously; land twice ploughed and in good tilth. The plots fertilised with superphosphate at 56 lb. per acre showed a marked increase over the non-fertilised.

Bulby Brush (J. J. Milligan).—Sown on hillside soil after maize; twice ploughed, fertilised with 1½ cwt. superphosphate per acre. The crops did not make much headway until after the July and August rain; they then developed into fairly even, clean plots, the plot of Mulga running third in the champion district contest.



A Fine Crop of Clarendon at G. F. Paterson's Farm, Bulby Brush.

Timagog.—Rich alluvial soil; previous crop late maize, stalks burnt, ploughed once. The land was in good tilth and there was a splendid early growth, but they went off considerably during September. Rust bad in oats, especially Belar and Guyra. Part lodged. Still a very nice plot.

Gladstone.—Loam soil; paddocks cropped with maize for many years; one ploughing given after late maize. Sown too late (27th July) and land not fallowed, but fairly good crop considering that barely 50 points (farmer's estimate) of useful rain fell during the growing period. The oats rusted, and the vetches failed.

East Kempsey.—Heavy alluvial soil; ploughed once after potatoes; sown a little late. Germination was on the thin side. Belar rusted badly, and other oats to a less degree; Sunrise grew to over 7 feet. The peas and vetches failed, but there was a nice plot of Florence wheat.

Dumaresq Island.—Rich alluvial soil; previous crop late maize; one ploughing; sown late. Belar rusted badly. The Gresley was a nice plot, fine in stem and leafy; but not really so good as a competition plot of Sunrise adjoining on old potato land, ploughed and sown earlier and fertilised.

Bulby Brush (G. Paterson).—Creek flat, soil of a rather stiff nature. The land was ploughed twice and was in good tilth. These were very fine plots, even and practically free from rust, but they were on the thin side.

Taree Estate.—Rich alluvial soil, previously sown to a variety of crops (cow-corn, cow-cane, and potatoes). Ploughed three times, and a bag of superphosphate sown to the acre. The growth was very good, except on the portion where cow-cane had been grown. Mulga was good, but coarse,

Florence Wheat on F. A. Waters' Farm, East Kempsey.

Florence and Trabut were nice even crops. Black winter rye was an excellent plot, making three growths. It is very suitable for early sowing and can be fed off a number of times.

Ghinni.—Alluvial soil, somewhat heavy; cultivated for a number of years; previously sown to winter fodders. Ploughed once; a second sowing could not be made owing to wet conditions. Mulga and Belar took rust badly.

Mondrook.—Good second-class high land, loamy, shallow; previous crop maize. Ploughed twice and disced; sown 13th May. Did not do well after heavy June and July rains. Plots uneven, and not up to previous lots. Rust noticeable in the oats.

Mount George.—Rich alluvial soil; previously sown to maize. Ploughed twice; sown 29th April. Very nice and even plots. Little rust noticeable in the oats, Mulga especially growing rank and dense; Belar was too late and took rust worst. A section of the Florence wheat was allowed to ripen, and yielded at rate of 39 bushels per acre.

Paterson.—Alluvial; previous crop maize (stalks ploughed in). Crop sown 12th May. Heavy rain fell shortly afterwards, and the plots did not do well for some time. Rust was present in the oats.

Tinonee.—Two sowings. On alluvial soil, twice ploughed and twice disced, Trabut barley did better than Skinless. Belar oats were a bit rusty, Mulga fair. On second-class soil, oats did poorly owing to unfavourable conditions and were fed off. The wheat yielded fairly well.

Bandon Grove.—A rich alluvial flat, previously sown to saccaline; land ploughed twice, and in good tilth for sowing; fertilised with 100 lb. superphosphate per acre. These were exceptionally good crops, although they lodged somewhat after the August winds. It was noteworthy that less lodging took place where the mixed cereals (wheat and oats combined) were sown. Portion of Mr. Smith's plot was entered in the Winter Fodder Contest, and filled second position with credit.

Behaviour of Varieties.

Sunrise oats is the most widely grown winter cereal, and it is doubtful whether we have any other variety that can compare with it for suitability. It comes early enough, is succulent and leafy, stands up well, comparatively speaking, lends itself admirably as a host to leguminous crops, and yields heavily. While it takes rust, it is probably more resistant than Belar and Mulga.

Mulga and Myall are two very useful varieties, and are increasing in popularity. They are somewhat similar in habits to Sunrise, but vary a little in period of maturity. Both did well in competition plots this year. Mulga is rather coarse in the stem, but lodges more than Sunrise, owing possibly to its heavier growth. Myall gave a splendid yield at Vacy—the heaviest of the series.

Belar is rather too late (three to four weeks after Sunrise). It is leafy and fine in the stalk, but takes rust badly and did not impress. Guyra and Lachlan are also susceptible to rust in a bad form and might easily be replaced by the earlier mentioned varieties. The former topped the yields at Timagog and was very flaggy.

Of the wheats, Florence is popular for its earliness, and Gresley for its leafiness and fineness of stalk. The latter variety has proved valuable for inclusion in oat plots in the Dungog trials. To these may be added Clarendon, a very useful variety. Firbank and Canberra rank among the next best sorts.

Except on one or two of the best prepared plots, vetches were a failure throughout. Field peas did moderately well. Farmers are recommended to include a mixture of these with the cereal plot. Some very desirable sorts of field pea are now available.

Barleys are not widely grown. So many inferior crops have been observed during the past few years that oats and wheat are now regarded as more reliable. There is probably only one reason why barley fails—it

Dun Peas on the Macleay—a Variety widely Grown on the Rivers.

On the left, Sunrise Oats and Gresley Wheat are standing well; on the right, Sunrise Oats alone have lodged badly.

only gives of its best in very well prepared land, and this it does not usually get. Cape is the most widely grown variety, but Trabut is superior. It has done well for a number of years now on farmers' experiment plots.

Black Winter rye is a crop not widely sown, but it is a valuable one for early cow feed. It is doubtful whether any other cereal comes so early and can be eaten off so soon and so often. It can be sown early in February; it is a splendid milk producer. Allowed to mature, it is not of course so useful, owing to its tough stems.

A great number of farmers now use fertiliser on their plots—mostly superphosphate in applications up to 2 cwt. per acre, and in some instances a top-dressing with nitrate of soda at ½ cwt. per acre is given. Fertiliser keeps the crops growing, gives them greenness and freshness (thus warding off rust), and increases the yield. Failure to apply fertiliser nowadays is a sign of unprogressive farming.

For a succession of crops through the winter and spring, sowings should be made commencing late in February and terminating early in July. Only well-prepared plots should be availed of.

RESULTS of Winter Green Fodder Trials, Lower North Coast.

	Timagog.	Gladstone.	East Kempsey.	Dumaresq Is.	Ghinni.	Taree Estate	Mondrook.	Tinonee.	Mt. George.	Bulby (G. A. Paterson)	Bulby (S. S. Milligan)	Paterson.	Vacy.
Date sown.	End April.	27th July.	15th May	6th May.	5th May.	21st April.	13th May.	17th April.*	29th April	22nd April.	19th May.	12th May.	19th Mch.‡
	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.
Sunrise oats ..	13 14	...	...	...	...	...	8 13	...	...	...	14 0	...	18 5
Sunrise & vetches..	14 7	...	11 1		...	...	8 7	...	...	...	...	...	17 0
Sunrise and peas ..	14 12	...	12 2	...	...		7 11	...	...	...	† 6 19	...	17 2
Guyra oats ..	18 10	...	5 17	...	...	...	9 19	...		...	...	...	...
Guyra and peas ...	...	...			...	...	9 1	...	...	...	...		
Belar oats ..	17 0	...	...	14 13	9 [illegible]	...	7 14	11 2	11 11	15 1	...	7 17	20 17
Belar and vetches..	...	...	...	...	...	...	...	...	...	...	...	8 8	...
Belar and peas ...	...	...	8 15			...	8 14	...	...	...	...	...	20 11
Myall oats ..	...	6 0	...	14 17		...	...	...	...	...	...	...	22 4
Mulga oats ..	...	...	...	...	8 6	16 8	...	10 14	14 12	...	12 15	8 17	...
Mulga and vetches	...	...	...	...	...	...	...	...	15 15	12 14	...	9 5	...
Mulga and peas ..	...	...	...	...	...	...	...	...	16 11	...	...	...	...
Lachlan oats ...	...	...	...	...	...	...	...	...	...	...	11 0	...	...
Binya wheat ...	...	...		...	...	...	5 1	...	...	...	...	...	...
Florence wheat ...	12 11	7 2	9 10	13 0	8 16	14 5	8 13	9 2	...	...	†5 2	12 2	8 11
Canberra wheat ...	...	6 2	...	...	...	...	11 11	...	...	8 14	...	10 0	...
Gresley wheat ...	...	...	...	14 5	12 12	...	9 9	9 11	12 5	...	...	11 15	8 4
Firbank wheat ...	...	...	...	...	...	...	10 2	...	12 0	...	...	...	...
Clarendon wheat ..	...	...	...	...	...	...	...	...	...	9 2	...	...	...
Trabut barley ...	...	...	...	...	...	13 10	...	...	...	...	...	...	...
Skinless barley ...	...	...	...	...	...		...	8 18	...	...	...	...	...
Black winter rye...	...	...	...	...	...	17 0	...	...	...	...	...	...	...

* Wheats sown 17th May. † Sown 23rd June. ‡ Wheats sown 23rd July.

Combination Plots.

A repetition of the previous year's trials was conducted with Mr. Alex. Smith at Bandon Grove. These comprise trials with wheat and oats separately, in combination, and in mixtures with vetches. The plots were very fine indeed, the farmer preparing the land (an alluvial flat) early and thoroughly prior to sowing.

The combination plots of wheat and oats mixed were outstanding, the most striking feature after the increased yield of the combined plot being the greater resistance to lodging compared with the individual plots.

Mr. Smith's Gresley wheat and Sunrise oats plot scored most points in the local Bureau Winter Fodder Contest and ran into second place with credit in the Lower North Coast Bureau District Championship.

The Myall plots suffer in comparison with the Sunrise plots, but the former were cut and weighed six weeks earlier.

Vetches, except in patches, were a partial failure.

The plots were sown on 15th April. The yields were as follows:—

	t.	c.		t.	c.
Sunrise oats	18	17	Myall and Gresley wheat ...	14	18½
Sunrise and Gresley wheat ...	19	4	Myall, Gresley, and vetches ...	15	7
Sunrise, Gresley, and vetches	19	6	Myall and vetches	17	13
Sunrise and vetches	21	8½	Gresley wheat	15	13½
Myall oats	12	10½	Belar oats	19	7

Fertiliser Trial with Oats and Vetches.

A fertiliser trial conducted on Mr. Richards' farm, at Bulahdelah, resulted in the following yields:—

	Manured with 56 lb. superphosphate per acre.		Unmanured.	
	t.	c.	t.	c.
Mulga oats and vetches ...	4	4	1	15
Sunrise oats and vetches ...	4	1	2	2

The season was unfavourable for higher yields.

Remarks.

Although increased interest is being taken in the production of winter fodders, their importance is still to be fully realised. Considering that probably 90 per cent. of the farmers in the district are "mixed" agriculturists—that is, that they combine in their farming dairying and pig-raising, necessitating the more or less extensive use of green fodders—one wonders why the majority, with almost every convenience at hand as regards climate, soil, and rainfall, treat the matter so apathetically. Seasons and other conditions have changed since the days when a farmer could rely on nature to supply his wants. There are too many caught napping nowadays.

That it is possible by good cultural methods (rotation, use of the most suitable crops sown at the proper time, and preparation of the soil at least three months ahead) and pasture improvement to nullify the effect of even the most severe drought there is every reason to believe.

The South Coast.

R. N. MAKIN, Senior Agricultural Instructor.

EXPERIMENT plots with varieties of wheat, oats and barley, suitable for green fodder were conducted by the following South Coast farmers during the past season :—

J. W. Childs, Camden.
J. Chittick, Kangaroo Valley.
L. B. Garrad, Milton.
A. H. Lucas, Albion Park.
W. Cook, Aylmerton.
J. Richardson, Jamberoo.
H. J. Bate, Bodalla.

The season proved a peculiar one. From the beginning of the year up to the sowing time (the middle of March) dry weather prevailed, then heavy and continuous rain fell until about July, when another comparatively dry spell set in which continued throughout the harvesting period. Unusually mild temperatures were experienced for winter months. These conditions were certainly favourable for the production of good oat crops, many being seen on different parts of the South Coast, and in many centres farmers were interested to the extent of exhibiting at butter factories and elsewhere small sheaves of oats of extraordinary growth.

Sunrise Oats on the Farm of Mr. A. Chittick, Kangaroo Valley.

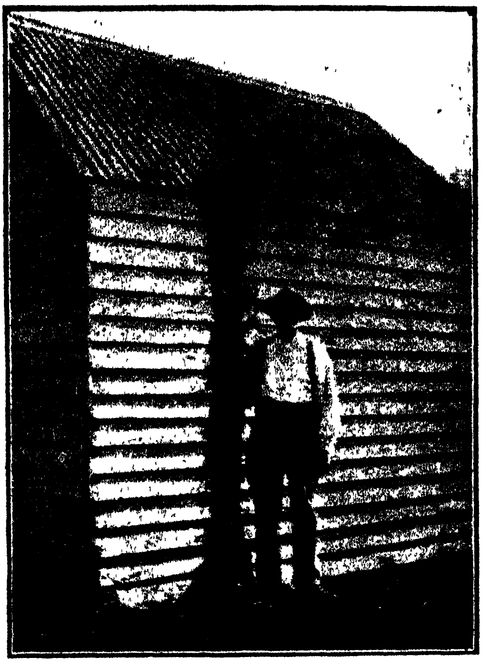
They grew 8 feet 6 inches high and yielded 23 tons 14 cwt. of green fodder per acre.

It is interesting to record the high yields from Sunrise oats on plots at Camden and Kangaroo Valley, where yields in each case of 23 tons 14 cwt. per acre of green fodder were obtained, establishing a record for farmers' experiment plots in the State. It is also interesting to note that these two plots were sown in March and harvested within a few days of each other in August, the crops being very free from rust and standing well considering the unusual height. At Kangaroo Valley in a paddock of Sunrise oats adjacent to the plots, a sheaf was cut which measured 8 ft 6 in. in height. The straw was coarse but not unpalatable. The crop was cut for green fodder, being chaffed before feeding to the cattle.

Attention must also be drawn to the fact that March planting should be adopted. Later sown crops are not to be compared with those sown as mentioned.

The Milton plot, unfortunately, was badly washed by heavy rain. Albion Park was sown altogether too late. Bodalla plot was also sown late, and was eventually fed off a couple of times; subsequently it was allowed to run to ear and cut for hay. The Jamberoo plot was also sown too late for early green fodder.

The outstanding feature of the crops under test was the quick growth and satisfactory return from Buddah oats, a new variety produced by the Department. From the dairy farmers' point of view, it is an exceedingly valuable addition to other varieties recently introduced. Seed supplies are short at present; should it maintain its reputation it will not take long to work up a stock. Many dairy farmers are giving more attention to grazing oats, and for this purpose Mulga has proved very suitable, being exceedingly palatable as compared with other varieties — particularly Algerian.



A Sheaf of the Sunrise Oats.

The three wheats that have been under test now for many years again proved their worth —in fact the growth of Florence at Camden was remarkable as it came out well into ear in about seventy days. This was certainly the earliest development known on the experiment plots. These wheats will be found very suitable on the lighter soils, especially on hill country.

Seed of all varieties was sown broadcast at the rate of 2 bushels per acre, with standard superphosphate at 2 cwt. per acre, distributed broadcast.

No special cultivation was given these plots. The usual practice on the South Coast is to plough the land before sowing, sow the seed and fertiliser, and then harrow it in. The practice generally adopted on the farmers' experiment plots is to plough and harrow the ground a month or so before sowing, and just before sowing to plough again. This procedure is productive of the best results.

YIELDS from Variety Trials.

	Kangaroo Valley.				Camden				Milton.				Albion Park.			
Sown	16 Mar., 1926				16 Mar., 1926				15 April, 1926				5 May, 1926.			
Rainfall...	2,290 points				1,604 points				3,198 points				Not available.			
Wheats—	t.	c.	q.	lb	t.	c.	q.	lb.	t.	c.	q.	lb	t.	c.	q.	lb.
Florence	11	12	3	12	12	0	0	0	10	4	0	0	5	1	0	22
Firbank	11	8	2	4	15	14	1	4	10	2	0	0	6	17	1	0
Gresley	11	17	0	0	16	17	0	16	8	0	0	0	8	17	0	0
Oats—																
Algerian	20	5	3	8	21	8	2	8	5	14	0	0	4	12	0	0
Sunrise	23	14	0	0	23	14	1	4	7	17	0	0	8	0	0	0
Mulga	19	9	1	12	20	0	0	0	8	12	0	0	6	12	0	0
Myall	19	0	3	16	18	17	0	16	9	18	0	0	5	18	0	0
Guyra	18	8	0	22	20	11	1	20	10	11	0	0	....			
Buddah	22	0	0	16	21	8	2	8	....				8	8	0	0
Barley—																
Trabut	16	18	2	8	16	5	2	24	5	5	0	0	9	1	0	0

At Kangaroo Valley, Florence wheat was harvested on 8th July, Firbank and Gresley wheat and Buddah oats on 3rd August, Sunrise, Mulga, and Myall oats and Trabut barley on 13th August, and Algerian and Guyra oats on 28th August.

At Camden, Florence wheat was harvested on 27th May, Buddah oats on 30th June, Firbank wheat and Myall oats on 14th July, Mulga oats and Trabut barley on 21st July, Gresley wheat and Sunrise and Guyra oats on 14th August, and Algerian oats on 1st October.

At Milton, Florence and Firbank wheat were harvested on 16th August, Gresley wheat and Algerian, Sunrise and Mulga oats on 30th August, Myall oats on 9th September, and Guyra oats and Trabut barley on 26th September.

At Albion Park, all the crops were harvested on 5th October.

KNOWLEDGE AS A FERTILISER.

TWENTY-FIVE years ago a straight furrow was regarded as the whole evidence of a good farmer, remarked Mr. W. W. Watson, in a recent issue of the *Gazette*, but knowledge of soil requirements and conditions was actually worth miles of straight furrows. Farmers should acquire this knowledge and apply it—they should plough it in.

Farmers generally are beginning to realise that knowledge is the best of all fertilisers; there is nothing like it for making the soil productive, and of all fertilisers it costs the farmer least. Those who are desirous of keeping in touch with the latest discoveries in agricultural science, reduced to terms of profitable farm practice, should write for the list of publications issued by the Department. Most of the literature listed is supplied to the farmer gratis, and for all of the methods described can be advanced that amplest of recommendations— they pay.

Advantages of Locally-grown Pea Seed.

J. DOUGLASS, H.D.A., Agricultural Instructor.

THE Department has for some time been advocating that local pea growers should make an effort to harvest seed, an average crop of which at the present high price of seed should give a profitable return. The price of pod peas usually decides whether seed shall be saved or the pods marketed. In good years when low prices are ruling local growers save sufficient seed for their own use, but few farmers make this a regular practice, with the result that there is no assured regular supply. In the districts most suitable for seed production winter feeding of stock is necessary. The vines, &c., after threshing make a good stock fodder.

Practically the whole of the pea seed used in New South Wales is imported from New Zealand and the United States, and its price fluctuates according to the season. Importers have to pay heavy freights and an import duty of 1s. 6d. per 100 lb.

During the year 1924-25 New South Wales imported under the heading "peas and beans" 5,633 tons, valued at £20,483. As practically the whole of this produce can be grown locally, this sum of money is lost to our farmers annually. A certain amount of risk is also being taken of introducing disease with the seed. Under the present system of obtaining a seed supply farmers have no control over such matters as purity. By growing their own seed attention could be given to "strangering," plant selection, and general seed improvement.

In order to demonstrate the suitability of locally-saved seed, the Department recently conducted trials with growers at various centres. The yields were compared with those from imported seed, Greenfeast being the variety used in both cases.

Grower.	Yield from Local Seed		Yield from Imported Seed	
	bus.	lb.	bus.	lb.
A. McBurney, Baulkham Hills	120	20	115	0
G. Townsend, Penrith	120	0	87	4
F. A. Hayes, Kurrajong	183	22	174	23
Average	141	14	125	18

It will be seen that the locally-saved seed in every case produced a heavier yield than the imported. Taking the plots on the whole the average increase was 15 bushels 24 lb. At 5s. per bushel this represents an increased return

of 79s. 4d. per acre. When farmers save their own seed this increase should be ample to pay for any harvesting expenses incurred, and compensate for any loss of return from the previous crop.

The results obtained at Penrith are most outstanding. Every care was taken to see that the plots received uniform treatment throughout the trial. This particular district suffered badly from a dry spell in the later stages of growth. It was apparent before picking that the locally saved seed was setting many more pods than the imported sample. Mr. Townsend remarked that over his whole crop (six acres) the locally saved seed was the more prolific yielder.

Infectious Diseases Reported in January.

The following outbreaks of the more important infectious diseases were reported during the month of January, 1927:—

Anthrax	3
Pleuro-pneumonia contagiosa	13
Piroplasmosis (tick fever)...	Nil.
Blackleg	2
Swine Fever...	Nil.

—Max Henry, Chief Veterinary Surgeon.

To Safeguard Farm Stock.

Farm stock may be safeguarded (1) by preventing the introduction of infection; (2) by good hygiene; (3) by correct feeding; (4) by use of vaccines, drugs, and licks; and (5) by preventing parasitic infestation. In relation to all of these, the farmer has a certain obligation—to the Department of Agriculture, to other farmers, and to himself. The principles enumerated, and their practical application to average farming conditions are subjects discussed in Farmers' Bulletin No. 137, "Safeguarding Farm Stock from Disease." The bulletin is obtainable for 10d., post free, on application to the Under Secretary, Department of Agriculture, Sydney, from whom a list of departmental publications (sale and gratis) is obtainable free.

When to Sow Grasses.

English grasses on the coast and tablelands are best sown in the autumn, say, March or April. In the more elevated tablelands, however, and where the spring and summer rains are constant, good stands are often obtained by sowing any time during the winter. Most English grasses, though little affected by frosts, make slow growth in the winter months. The root system, however, becomes well established during this period, and, when the warm spring arrives, the grasses make rapid growth.

Summer grasses like paspalum, Rhodes, kikuyu, and Sudan are best sown in the spring. Some farmers sow paspalum at any period during the summer months, but there is a risk attached to this, owing to the quickness with which the soil surface dries out, thus affecting germination.

Defective Germination in Peas.

The Desirability of Local Seed Production.

H. J. HYNES, M.Sc., B.Sc.Agr., Assistant Biologist.

During the past few years many instances of defective germination in peas have been experienced by growers in different parts of this State. In some cases the seed germinated poorly, resulting in thin stands, while in others complete failures were incurred. Field observations indicated that the trouble was closely associated with the use of imported seed.

The situation became rather acute on sections of the Murrumbidgee Irrigation Areas last year, with the result that the matter received special investigation on a number of farms at Griffith in March, 1926. Laboratory and glasshouse studies were also conducted on selected seed samples with a view to further elucidating the problem. The results of these several investigations are outlined hereunder.

Field Observations in New South Wales.

Field observations showed that most of the pea seed sown on the Griffith area for the autumn crop was of the variety Greenfeast, introduced from other countries. There was apparently some variation in quality of the different seed lots. On a few of the farms inspected fairly good germination resulted from the use of this seed, while on others (and this was the usual experience) the same seed germinated very poorly. Many of the seeds were found to have rotted in the soil, and microscopic examination revealed the presence of certain fungi in association with the condition. It was therefore important to ascertain whether any of these organisms was seed-borne, and, if so, to determine whether the defective germination of the seed could be wholly or partly explained on that basis.

The low germination capacity of certain seed lots was very evident on those areas where locally-produced seed and imported seed were planted under strictly comparable conditions. In such cases it was not uncommon to find a germination of 90 per cent. and more with local seed, as against 25 per cent. or less with imported seed. Isolated cases of complete failure with the latter were recorded.

In many instances, where the seed was sown by hand, and therefore usually at a heavier rate in place of the drill, quite good stands were produced; but examination showed that the percentage germination was often as low as in cases where the seeding was made with the drill at a lesser rate. The fact is that heavy rates of sowing tended to obscure the defective germination which was so evident at the normal rate of sowing.

Other varieties grown at Griffith included American Wonder, Greenfeast (American-grown), Witham Wonder, and others. In cases where seed of these varieties germinated poorly in the field it was found that faulty methods of culture were contributory factors.

In making a general survey of the situation at Griffith full account was taken of factors other than source of seed, viz., date, rate, and method of planting, fertilisers used, methods of cultivation and irrigation, previous cropping history, &c. A study was also made of climatological data obtained from the office of the Water Conservation and Irrigation Commission, Griffith. It was found that in January the maximum and minimum temperatures recorded were 104 deg. Fah. and 50 deg. Fah. respectively, with an average maximum of 88 deg. Fah. and an average minimum of 61 deg. Fah. In February, 109 deg. Fah. and 52 deg. Fah. were the recorded maximum and minimum temperatures, while the average maximum was 94 deg. Fah. and the average minimum 65 deg. Fah. Individual growers stated that this was the hottest season experienced for many years.

The field observations led to the conclusion that faulty germination in peas was due to the use of imported seed, and that the trouble was accentuated by the high temperatures which prevailed during the early part of the year. A number of growers in the Exeter district in 1925 also experienced unsatisfactory germination with Little Marvel imported seed. An examination of a number of seed lots in bulk, from which seed had been sown at Griffith with unsatisfactory results, showed that many of them were of very inferior quality. In many instances the seed coat was definitely cracked and uniformly discoloured, while in others the seed showed definite brown spots. The problem received further investigation in the laboratory and glasshouse.

Laboratory and Glasshouse Studies.

Before proceding with an examination of the seed samples from Griffith it was necessary to determine a satisfactory method for surface sterilisation of pea seed. A uniform sample of Greenfeast seed was employed for the test, and treatments were made with formaldehyde, calcium hypochlorite, alcohol, mercuric chloride, and alcohol plus mercuric chloride.

From the standpoint of seed disinfection, germination, and subsequent growth the experiments demonstrated that mercuric chloride (0·1 per cent. for twenty minutes), or alcohol (70 per cent. for two to three minutes) followed by mercuric chloride (0·1 per cent. for twenty minutes), was quite satisfactory. The treatment with calcium hypochlorite proved very effective in eliminating organisms from the seed surface, but the germination was retarded somewhat; alcohol, used alone, was ineffective in completely disinfecting the seed.

Laboratory and glasshouse experiments were then planned to determine whether the germination of selected seed samples from Griffith was such as had been experienced with the same seed under field conditions. The inferiority of certain of the samples was due to the cracked and discoloured condition of the seed envelope, and this feature, doubtless, was responsible for many of the failures in the field. It was important to know whether the defective germination was due to any factor other than seed coat injury—whether any organisms were seed-borne, and if so to what extent they were responsible for faulty germination.

Seed of the selected samples was then surface sterilised by treatment for one minute with 70 per cent. alcohol, followed by 0·1 per cent. mercuric chloride for five minutes. The period in mercuric chloride was shortened in order to avoid, as far as possible, any action the disinfectant may have on any organisms borne internally. After washing in sterile water, the seed was plated on potato dextrose agar in large dishes, which were kept at room temperature for ten days. A portion of the seed from each sample was also sown untreated in unsterilised soil in 7-inch pots. These were then kept in the glasshouse for three weeks.

The results of these investigations are summarised in the following table:—

GERMINATION Tests of Pea Seed from Griffith.

No.	Sample.	Source.	Germination per cent Laboratory	Germination per cent Glasshouse	No. Diseased per cent. Laboratory.
1	Greenfeast	Imported A	62	60	60
2	"	"	56	46	33
3	"	Imported B	97	92	0
4	"	N.S.W.	80	100	4

The data support the conclusions drawn from the field observations at Griffith. Samples 1 and 2 were both representative of bulk lots, the seed of which appeared anything but uniform, and which had germinated poorly in the field. Samples 3 and 4, on the other hand, were selected from batches the seed of which appeared quite normal, and which had germinated well in the field. In samples 1 and 2 the germination was clearly very poor in the laboratory and glasshouse; some seeds commenced to sprout, but soon rotted owing to the action of various organisms. Four distinct fungi were isolated from the seed of these two samples, viz., *Phoma* sp., *Cephalothecium* sp., *Rhizoctonia* sp., and a sterile fungus.

These organisms were then propagated on sterilised mixtures of moistened wheat and oats for soil inoculations. Seed of normal Greenfeast peas was planted about 1½ inches deep in the soil at the rate of twelve seeds per pot. The results of the experiment conducted in the glasshouse for five weeks are presented in the table below:—

PATHOGENICITY Tests of Fungi isolated from Inferior Pea Seed, Griffith.

Organism.	No. of Seed Germinated Pot A.	No. of Seed Germinated Pot B.	Remarks.
Phoma sp.	0	0	
Rhizoctonia sp.	4	1	Plants stunted, 1½ inches high; root system destroyed; base of stem discoloured black; two plants dead in pot A.
Cephalothecium sp. ...	9	10	Plants 5 to 8 inches high; greyish-brown lesions at base of stems; scant production of root hairs; two plants dead in pot A. and four in pot B.
Sterile fungus	11	11	Plants 4 to 7 inches high; root system fairly well developed; lesions evident at base of stems of stunted plants; two plants dead in pot A.
Control	12	12	Plants healthy, 8 inches high, root system well developed.

It is evident from the tabulated data that the organisms under test are capable of reducing the germination of pea seed, and of checking the development of the plants through injury to the stem and root system. The most severe pathogenes seem to be *Phoma* and *Rhizoctonia,* whereas *Cephalothecium* and the sterile fungus are not so virulent. Survey work on pea diseases in the United States ([1], [2]) has indicated that a number of fungi are capable of causing root rot in peas in that country. These include *Phoma, Rhizoctonia,* and a sterile fungus.

Not one of the organisms isolated from inferior pea seed has been found on diseased pea plants in the field. The fungus *Fusarium,* however, has frequently been isolated from certain stem and root-rot conditions, but it has not been found to be seed-borne. No attempt has been made to determine the specific identity of this particular isolation, nor has its parasitism yet been tested under local conditions.

Discussion.

The investigation of defective germination in peas has definitely indicated that there is considerable variation in different imported seed lots. Many of the samples appeared quite uniform and clean, while in others a large percentage of the seeds was cracked, shrivelled, and discoloured. This inferior seed germinated poorly in the field at Griffith, and also in the tests conducted in the laboratory and glasshouse. The situation on the irrigation area last year was apparently accentuated by the high temperatures which prevailed at the time of planting and during the early growth.

The laboratory and glasshouse studies have demonstrated that the defective germination of certain seed lots was due to factors other than mere injury to the seed coat. Such seed may harbour certain fungi, which, under favourable conditions, play an important part in checking germination and in bringing about partial or complete destruction of the seedlings. These organisms apparently establish themselves in seed which has received injury either during or subsequent to harvesting, but they are not carried in normal seed.

As mentioned above, certain samples of Greenfeast seed appeared quite uniform and clean when examined in bulk. Germination, however, with this seed in the field was not always satisfactory. In most instances it was found that faulty cultural practices were contributory to the trouble, but in a few cases it was difficult to explain the situation. It has been suggested as an additional contributory factor that the imported seed may not be sufficiently acclimatised for best development under local conditions.

In conclusion, it might be stated that the investigations herein reported together with observations made in previous years in other localities, show that imported seed is not entirely satisfactory for growth under New South Wales conditions. It is thus very desirable that growers should, as far as possible, use seed supplied from local sources, and every effort should be made to stimulate the production of seed for local requirements.

Literature Cited.

[1] Jones, F. R. and M. B. Linford. Pea Disease Survey in Wisconsin. Wisc. Agr. Exp. Sta. Res. Bull. 64, 1925.

[2] Haenseler, C. M. Pea Root Rot Investigation. New Jersey State Agr. Expt. Sta. Rpt. 44:366-375, 1924.

Storage of Maize in Coastal Districts.

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.

THE climate of the North Coast is better suited for maize than that of any other portion of the State, and the greatest production of the crop is centred in this area. Of our large farming districts, the North Coast is the most closely settled, and with its diversified agriculture, embracing the natural combination of stock with maize-growing, it plays a large part in feeding the population of New South Wales. Maize is, therefore, an important basic primary product, and its production and protection from damage or loss is of paramount importance to the State.

In this district, however, the toll taken by insect pests (chiefly weevil) is much greater than in any other. The individual maize-grower suffers much annual loss from weevil, as much as 10 or 15 per cent. of the crop being estimated in some cases to be destroyed by this pest. The North Coast farmer regards this loss almost as a necessary evil. Although he sometimes gets the bulk of his maize off to market before it becomes too badly affected, he has perforce to keep a portion of it back for feeding on the farm until his next season's crop becomes available, and as this portion is not subjected to any protective treatment, it usually suffers considerable damage. This loss can be very largely avoided by the farmer. Many North Coast maize-growers have solved the problem of keeping sufficient seed maize free from weevil to enable them to have good sound seed for planting, and it only requires an extension of this system to save greater loss on the bulk maize.

On the far North Coast, late sown crops of maize (December and January) mature in July or August and are generally comparatively free from weevil in the field at harvesting, but they only remain so until September or October, and from then onwards weevil makes headway and causes great loss if the maize is held through the summer without protection or treatment. In this district, however, early maize can be sown in August or September, and it will be mature and fit for use on the farm in December or January. There is a period of a few months, then, on the North Coast farm in which maize must be stored for use on the farm, and during which it must be treated in storage to prevent loss from weevil. The early-sown crops are affected with weevil in the field before harvest, and a fair amount of practically unavoidable damage is done to these crops before the maize can be treated. The amount of damage done to a maize crop in the field depends largely on the time between the maturity of the crop and the advent of cold weather, the earliest maturing crops usually suffering most. This is because the weevils which have bred out from the over-wintering stage fly out from the sheds and barns to the earliest maturing crops in the vicinity. Such crops, ripening their grain in

warm weather, when the development of weevil is at its height, quickly become infested, and if left for any time become liable to additional broods of weevils, which increase rapidly in numbers with each brood while climatic conditions remain favourable. On the advent of cool or cold weather, the pest becomes less prolific and destructive, and maize crops which mature in winter are not generally much affected.

Treatment of Early Sown Maize.

From the foregoing it will be seen that early crops of maize which ripen in warm weather require to be harvested quickly in order to save loss from weevil in the field. There is of course a danger in harvesting this maize while too soft and storing it in a shed, as heating may develop which will favour further marked damage from weevil and moulds. Maize which is inclined to be soft or to contain excess moisture generally stores better if the husk is removed, and the removal of the husk in harvesting weevil-infested maize also has the effect of disturbing the weevils and shaking a large number free from the cobs, so that fewer weevils are taken into storage with the maize.

The best advice that can be given regarding such early harvested maize is to get it on to the market as quickly as possible, not attempting to hold it for feeding on the farm any longer than necessary, nor attempting to store it for a better price. In the first place, the price of maize from December or January to March or April is usually higher than it is later on in the winter or in spring. In addition to this, a loss in weight takes place from loss of moisture and from weevil damage, and in order to cut these losses of price and weight, it is far better business for the farmer to sell early harvested maize as soon as it can be shelled. To do this, farmers will see that it is an advantage to husk the maize in the field at harvesting to facilitate drying and to rid the maize of weevil for the period of storage necessary before it is sufficiently dry to shell. Where large areas are grown, they are dealt with more economically, of course, by harvesting in the husk and shelling with the husker and sheller. Generally, however, on the far North Coast, large areas of early maize are not grown because the seasons are not so favourable as they are to late maize.

Under the circumstances, it is not desirable to attempt to store the early maize crop. To store coastal maize successfully and economically for any length of time it must be stored as shelled grain. Shelled grain will not store successfully in bulk unless it contains less than about 14 per cent. of moisture, and while one is waiting for an early maize crop to dry sufficiently to shell and store safely, weevil is making rapid development and causing serious destruction.

Store the Late Maize Crop.

For these reasons, it is the late rather than the early crop which should be stored on the farm if any maize is going to be held for any time. As previously mentioned, maize crops maturing in winter are practically free from visible

weevil life and remain so until the warmer weather of spring. But by this time the maize has dried out naturally to a sufficiently low moisture content for shelling and safe storage in bulk, and it is this maize which lends itself to storage on the coastal farm.

The plan should be adopted by the coastal farmer of gaining experience by storing sufficient of this late crop in early spring for farm use to tide him over until part of the early crop comes in. Then, should the experience thus gained lead him to the belief that such maize can be stored efficiently for an assured market rise, the storage accommodation can be extended to make provision for this.

Meantime, however, every coastal maize-grower should make provision for storing maize for the feeding of farm stock from October or November until January or February, when new maize from the early crop is available. Undoubtedly the best method of storing such maize is as shelled grain in galvanised-iron tanks specially constructed for the purpose. More will b

The Adult Weevil. 1.—Larva. 2.—Pupa.

Common Grain Weevil (*Calandra oryzae*).

said of these later. Meanwhile it is necessary for the farmer to understand something of the life-history of the insects which are chiefly responsible for the damage of maize grain in storage. The most important of these, by far, is the so called "grain" weevil, which is really the rice-weevil (*Calandra oryzae*).

The "Grain" Weevil.

The "grain" weevil is a black to reddish-brown insect, about $\frac{3}{16}$ in. long, with a long proboscis or snout, at the end of which is its mouth. Many farmers persist in thinking that the grain moth is a stage of the weevil and that the weevil itself cannot fly. The first two things that farmers must learn about this insect are—(1) that it has nothing whatever to do with the grain moth, which is an entirely different insect, with its own life-history;

and (2) that the weevil itself has perfect flying wings under its black wing covers and that it can fly. Fields of maize become infested with weevil which fly from the sheds and barns at the time the crop is ripening. These weevils lay their eggs on ears of maize which have a poor or damaged husk covering and are thus exposed to view or to the ready entrance of the weevil. Ears which are well covered with a close, tight-fitting husk are almost invariably free from weevil infestation. Once inside the husk, the weevil travels about the ear freely and lays its eggs on the grains. The weevil punctures the grain with its hard minute jaws which are at the tip of its sharp proboscis, and lays an egg in the small cavity of the grain. The egg (too small to be distinguished by the naked eye) is then covered with a cement-like secretion for protection. A minute grub hatches out, and eats its way into the grain. On practically every grain which is infested (a sure indication of infestation) is seen the white tunnelling mark left by the grub. This mark is not difficult to detect in red or yellow varieties of maize, and farmers should be on the look out for this first sign of infestation, for its detection means a lot in the early treatment and control of the pest. The young grub has hard chitinous mouth parts, brownish black in colour, which it uses for eating its way into the grain. The rest of the body of the grub is very soft, creamy white in colour, and very thick, with the under surface straight and the back very much raised and curved into an almost semicircular form. Much damage is done to the grain by the weevil grub at this stage, as a good part of it is eaten before the grub changes to the pupa. In the pupal stage the insect elongates in form and is surrounded by a pupal skin, which is cast off when the pupa changes to the adult weevil. The pupa is white or creamy white in colour at first, but before it sheds the pupal skin, a considerable brown or reddish brown coloration appears. When the pupal skin is shed and the adult emerges, it remains inside the grain for three or four days actively feeding. It is usually during this stage that the germ of the grain is injured. The adult weevil finally forces its way out, leaving the characteristic small irregular hole in the grain. It then mates and the females lay eggs on sound grain for the next brood.

During favourable (warm, moist) weather, the eggs hatch in about three days. The grubs become full grown under the same conditions in two or three weeks, and the pupal stage may be gone through in three or four days. The whole life history may thus be passed in a month or less, but each of the stages in development may be prolonged for months under unfavourable conditions. In the egg, grub, or pupal stages, the insect is somewhat resistant to injury from fumigants and cold weather. Infestation in the field may occur in the dough stage of the grain, and in an early maize crop on the North Coast ripening in warm weather the next brood of weevils is already out by the time the grain is mature. The female adult weevil lays about 200 eggs, and theoretically, if all these eggs were to hatch and live to mature, it is possible for a single pair of weevils to increase to 200 in one month, 20,000 in two months, and 2,000,000 in three months. Even under practical conditions, therefore, weevils breed up and increase in numbers

very quickly, and the amount of damage they do if left unchecked is not surprising. Cold weather checks the activity and development of weevils and the winter on the North Coast even though mild, holds the weevil in check for a time, but it is ready to resume its work of destruction in spring.

There is an impression that maize from certain districts (such as the Tablelands and Tumut) has some qualities which resist or repel weevil, but the fact is that in these districts weevil does not exist in any stage in the maize grown there, as it matures in the winter and the climate is so cold that weevil could not live through it. But let Tumut or Tableland maize be taken to a coastal district and exposed to weevil and it will soon become infested. Hard, flinty maize is also supposed by some to be resistant to weevil, but although it may be somewhat less attractive to the weevil than soft maize, no maize is too hard and flinty for the weevil to attack.

There is an old saying among farmers that "weevils come out of corn but do not go into it." Others say that weevil develops "spontaneously" in grain, but the foregoing life-history explains how the weevil (in the grub stage) gets into the grain and an understanding of the life-history makes possible intelligent methods of control.

The Grain Moth.

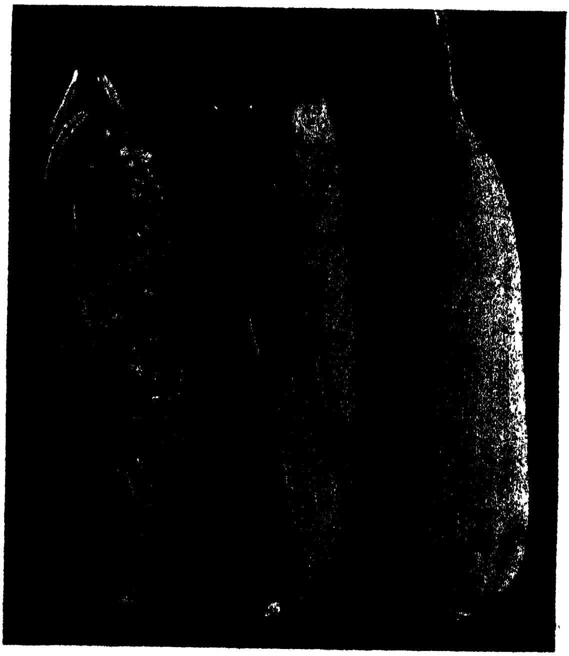
There is a widespread opinion among farmers that the Angoumois grain moth is a stage of the weevil just described, but a knowledge of its life-history at once dispels the idea of any connection between these two insects. Moreover, the Angoumois grain moth is found in many districts where the weevil does not exist, even in the Tableland district, although it is only the very coldest districts where but little maize is grown that the climate is too severe for the grain moth.

Angoumois Grain Moth (*Sitotroga cerealella*).
Moth, Larva and Pupa.

The moth is of a pale buff-brown colour, about $\frac{3}{8}$ inch in length, and $\frac{1}{2}$ to $\frac{5}{8}$ inch across the expanded wings. It also has a few dark-coloured markings on the fore wings, and a fringe of hairs on the lower side of each pair of wings. It is active at a lower temperature than the weevil, and consequently does more damage than the weevil during the winter, laying eggs when the weevil is inclined to be quiescent. One or several eggs are usually laid at the base of the grain on the ears while they are still immature in the field, only the tip grains on the ear usually being affected at this stage. The grain moth differs again from the weevil in that it seems to be able to infest any ear, no matter how well it is covered by the husk. It is not clear how the

delicate moth can directly cause this infestation in ears so well protected, but the fact of infestation suggests that the young caterpillars find their way down through the dried silk to the grain.

Under favourable conditions, the young larva or caterpillar hatches out from the egg in a few days, and usually makes its way directly into the grain near the tip. On feeding further into the grain, it makes a straight burrow just large enough to hold it, and leaves a circular patch of skin or hull on the outside of the grain which can easily be pushed aside by the mature moth when ready to emerge. The size attained by the larva seems to be determined by the size of the grain it enters. In wheat or in the small grains at the tip of ears of maize, the caterpillar grows no larger than $\frac{3}{8}$ inch, but in large maize grains it grows to over $\frac{1}{2}$ inch in length. The grain moth caterpillar is easily distinguished from the weevil grub by its greater length, cylindrical shape and annulated or winged appearance. Two or three grain moth larvae are often seen in a single maize grain, and the characteristic sign of their presence is always the circular piece of skin already referred to which is left on the grain. Unlike the weevil grub, the grain moth caterpillar usually leaves no sign of the point at which it enters the grain.



1 2 3

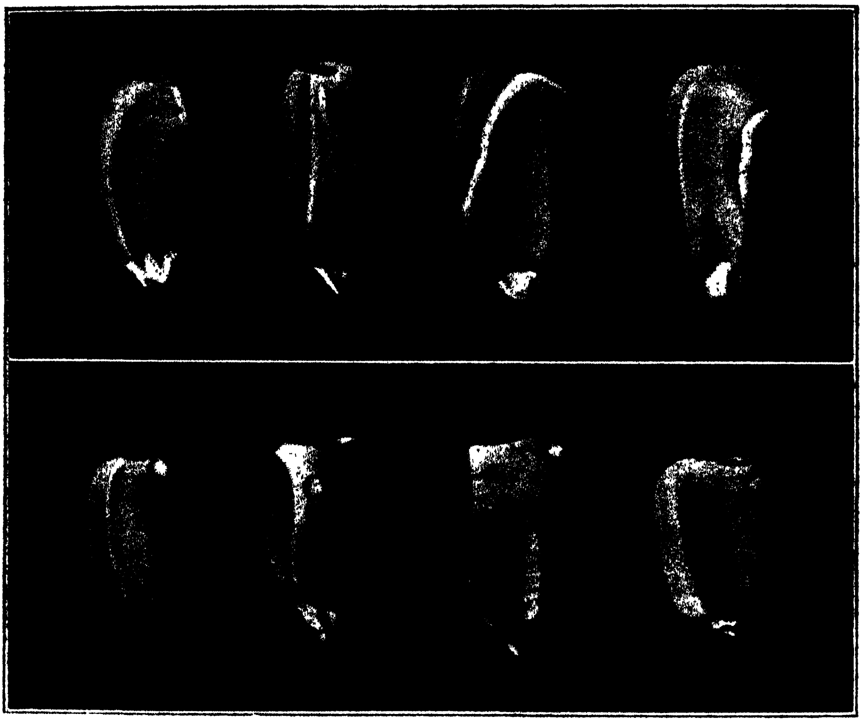
Types of Ears, showing—1, husk open and much of the ear exposed to insect and fungus attack; 2, tip exposed; 3, a well-covered ear.

After eating its way through the grain in a straight line to the opposite side near the crown of the grain, the full-grown larva spins a light cocoon round itself and pupates, or goes through a resting stage before changing into the adult moth. The larval or caterpillar stage usually lasts about three weeks, and the pupal stage a few days under favourable conditions; but, as in the case of the weevil, each stage may be prolonged considerably when these conditions are absent.

There are indications that the grain moth in all its stages (caterpillar, pupa, and moth) resists fumigation to some extent at low temperatures, though this may possibly be due to the fact that carbon-bisulphide gas at least does not

diffuse readily in cold weather. It is therefore advisable to select a warm day for fumigation with this substance during the winter should treatment be found necessary then.

The life-history of the grain moth has been treated in some detail because a knowledge of it, taken in conjunction with the nature of the moth, has an important bearing on the means of control. It will readily be seen that the moth is so delicate that if any obstacle is placed in the way of its emergence from the grain the pest is at once controlled. This actually happens when



Evidences of Insect Attack.

The top grains show the characteristic white mark made by the Weevil.

The bottom grains, attacked by the Grain Moth, show the circular patch of skin or hull on the outside of the grain, which can be easily pushed aside by the mature moth when ready to emerge.

the grain is shelled and stored in bulk or in tightly rammed bags. A grain pressing tightly against the exit hole of the infested grain will entirely prevent the moth from making its egress, and consequently no further infestation of the grain can take place. Stored in the ear, moth-infested maize goes from bad to worse. So the control of grain moth in maize becomes quite simple and effective—shell and store in bulk.

(*To be concluded.*)

A Top-dressed Pasture at Yanco.

F. G. CHOMLEY, Manager, Yanco Experiment Farm.

THE beneficial effects derived from top-dressing natural pastures, lucerne stands, &c., with superphosphate have long been realised. It was with a view to further demonstrating its value that a portion of a certain permanent winter pasture on this farm was top-dressed last autumn. The paddock had been originally seeded in 1917 with the following mixture:—Toowoomba Canary (*Phalaris bulbosa*) 4 lb., Awnless Brome (*Bromus inermis*) 4 lb., Chilian clover 1 lb., Burrless Trefoil 8 lb., Subterranean clover 8 lb. The paddock has since been grazed with sheep and cattle. *Bromus inermis* and Burrless Trefoil have not been in evidence for some years past, and the Chilian clover is now very patchy.

The top-dressing was carried out on 18th May with superphosphate at the rate of 200 lb. per acre.

The difference in the winter growth of Subterranean clover on treated and untreated land was most marked, the top-dressed portion as early as July being 2 to 3 inches higher than the remainder, which was sickly and showing the effects of frost. Late in the season the Toowoomba Canary grass came to the fore and made a dense stand 3 feet high on the treated land, whereas only occasional plants were to be seen on untreated land. On 19th October average portions were cut from the two blocks, from which the following yields were obtained:—

Treated with 200 lb. superphosphate ...	7 tons 1 cwt. 18 lb. per acre.
Untreated	4 tons 2 cwt. 16 lb. per acre.

The mat of clover on the treated area was so thick that it was impossible to cut close to the ground with the scythe.

Portion of this paddock was used three years ago as a quarantine pen for pigs, and the effects of the organic matter then added to the soil can still be noted; during last season the site of this old pig pen had a better appearance even than that top-dressed with superphosphate. Although the application of farmyard manure is, generally speaking, impracticable, still the fact must not be lost sight of that organic matter is much needed in the soils of the irrigation area, and no opportunity should be lost of turning in green manure, crops, straw, rubbish, weed growth, &c.

SILAGE AS FEED FOR DAIRY COWS.

THOUGH silage has a strong characteristic smell, good silage may be fed during milking. Some silage with a strong odour is preferably fed after milking. As milk is peculiarly susceptible to the absorption of odours, care must be taken in feeding it to milking animals to avoid every chance of this strong odour being absorbed by the fresh milk; and milkers, if they have been working with silage, should take care that their hands and clothes are thoroughly freed from the smell before they commence milking.—GEO. L. SUTTON, Director of Agriculture, Western Australia.

Manurial and Fertiliser Practice in Citrus Production.

AN EXAMINATION OF SOUTHERN CALIFORNIAN METHODS.

W. LE GAY BRERETON, Assistant Fruit Expert.

NOTWITHSTANDING the probably vast variation between conditions in South California and the citrus areas of this State, a comparison of Californian and New South Wales practices cannot fail to be of benefit. In what degree the methods correspond may be gathered from a study of Bulletin No. 374 of the College of Agriculture, University of California, "A Survey of Orchard Practices in the Citrus Industry of Southern California," by Mr. Roland S. Vaile. The purpose of the bulletin was to show from actual field records the influence of fertilisation, irrigation, ploughing, climate, soil, the age of trees, and the cost upon the profitableness of citrus orchards in Southern California. It is proposed to touch here upon only some of the above aspects.

The method employed in collecting the data is of interest, because upon this rests the reliability of the information supplied. An intensive survey was undertaken in the winter of 1922-23: "Approximately one thousand growers were interviewed, and specific information was gathered from them concerning their orchard practices, costs, and yields. The only records that were used in subsequent analysis were those that covered a five-year operating period." The last remark is of great importance. All citrus orchards under eight years old were eliminated, and only a small number under fifteen were included in this survey.

"In the analysis of any production data," remarks the author, "there are always two distinct phases involved. The first of these is the relation between changes in any variable on the one hand and physical production on the other. This relationship is always subject to the law of diminishing physical returns, and if the data are complete enough they may be studied in the light of this law. The practice which results in the greatest yield per acre may be called the 'most productive practice.'

"The second phase of the analysis is concerned with the effect which changes in any variable have on the profitableness of the enterprise. When viewed from this angle the data are to be interpreted in accordance with their approach to the 'limit of profitable cultivation.' The practice which results in the greatest net returns on the investment may be called the 'most profitable practice.'"

Fertilisation and its Effect on Yields.

The following observations are made in relation to fertilisation and its effect on yields:—

> The successful orchardists of the citrus industry have realised for some time that the supply of nitrogen available to the trees is one of the dominant factors of fruit production. . . . Comparatively little evidence has existed, however, as

to the amount of nitrogen that should be used. The present study gives a general basis for an answer to this question. In this study the total amount of nitrogen carried in concentrated commercial fertilisers is considered, together with an estimate of the amount carried in all applications of bulky organic manures.

The data gathered in this survey show a regular increase in average yields until about 350 lb. of actual nitrogen are applied per acre. With larger application there is an apparent decrease in yields. . . All groves that received as much as 350 lb. of nitrogen per acre annually were badly mottled, although most of them were still producing better than average crops. A considerable amount of mottle leaf was observed on the groves receiving 250 to 350 lb. of nitrogen. This bears out the observations made at Arlington experimental plots in 1915-16, when a heavy application of alfalfa [lucerne] hay, carrying nearly 400 lb. of nitrogen to the acre, was followed by a severe case of mottling which did not disappear for several years. Dr. I. G. McBeth has also reported that extreme mottling is often associated with high nitrate content in the soil. It seems probable, because of this association, that the most productive use of nitrogen for citrus orchards is reached somewhere between 300 and 350 lb. per acre annually.

Results from trials of the effect of varying amounts of nitrogen on yields conducted on a mature orange grove at Ontario by the Chaffey Junior College of Agriculture are quoted, and from these the following deduction is made:—

Three hundred pounds of nitrogen per acre gave the most productive use, but obviously 200 lb. represented the most profitable use in this case.

Of the growers interviewed, 30 per cent. are using only 100 lb. of nitrogen per acre, while 75 per cent. are using less than 225 lb. Approximately half of the nitrogen applied has been carried in bulky organic manure.

Plant-food Requirements under New South Wales Conditions.

In respect to the above amounts of nitrogen it must be remembered that in many of the citrus sections of California it is believed that nitrogen is the only plant-food that can be profitably applied to citrus orchards in the form of artificial fertiliser, whereas in New South Wales, both in the coastal and inland citrus districts, it is necessary to apply phosphoric acid as well as nitrogen. Whether it is profitable to apply potash has not yet been determined.

It is of interest to note what weight of fertilisers per acre are applied when the quantities of nitrogen per acre quoted above are given. The information that "75 per cent. are using less than 225 lb." is not very definite, but earlier remarks quoted indicate that application from 200 to 350 lb. per acre annually is the practice of some growers at least. For the sake of comparison, therefore, let us take the quantities 100, 150, 200, 250, 300, and 350 lb. It is mentioned that approximately half the nitrogen applied is carried by some form of bulky organic manure, so only half the above weights of nitrogen, *i.e.*, 50, 75, 100, 125, 150, and 175 lb., are supplied by the artificial fertiliser.

To supply these with sulphate of ammonia containing 20 per cent. nitrogen would mean using 250, 375, 500, 625, 750, and 875 lb. respectively per acre. But, as already pointed out, in New South Wales it is also necessary to supply phosphoric acid as well as nitrogen, and a very common practice is to use blood and bone fertiliser. This, of course, varies to some extent in its nitrogen and phosphoric acid content, but assuming that it contains 5 per cent. nitrogen and 17 per cent. phosphoric acid, and assuming that

the trees count 100 to the acre, then 10 lb. per tree (1,000 lb. per acre) would supply 50 lb. nitrogen and 170 lb. phosphoric acid per acre; 20 lb. per tree annually on the same basis would, of course, supply twice these quantities, making 100 lb. and 340 lb. of nitrogen and phosphoric acid respectively. But it must be remembered that in New South Wales the application of blood and bone or some other concentrated fertiliser is often the only feeding carried out, and that only occasionally is a bulky organic manure applied, or a leguminous cover crop ploughed under, whereas in California the nitrogen supplied annually in the artificial fertiliser often only forms half of the nitrogen supplied. To double even the smallest amount of nitrogen quoted (*i.e.*, 50 lb. per acre) by means of a bulky organic manure would mean a very heavy annual dressing of this latter.

In drawing attention to the large amount of nitrogen supplied to citrus trres in California as compared with the amount given here, it is in no way suggested that the citrus trees in our best-cared-for orchards are being partially nitrogen-starved. From the results obtained here from a far smaller nitrogen ration, it is quite reasonable to suppose that our citrus soils have a naturally higher constant supply of available nitrogen. On the scores of tree health, fruit quality, and economy it would be most unwise to rush into such heavy nitrogen feeding practice as that quoted above. As to economy it must be remembered that the cost of nitrogen is one of the main factors in controlling the "most profitable practice."

The questions as to whether the correct proportion of nitrogen, phosphoric acid and, perhaps, potash, is being supplied to our citrus trees, and whether heavier dosages of fertilisers per tree would be profitable are nevertheless opened up. These questions can only be answered by field trials in each orchard, and in some cases in different parts of each orchard. Soil fertility is controlled by so many conditions that one set of fertiliser trial plots in a district is not a reliable guide to a fertiliser practice for the whole district. Growers are, therefore, urged to carry out such trials. For instance, if their practice has been to fertilise with blood and bone, an even bed of trees on a soil as uniform as possible should be divided into, say, six plots of not less than ten trees to the plot, continuing on one plot with the same dose of blood and bone as formerly, on another using the same dose of blood and bone, plus sulphate of ammonia, to increase the nitrogen, and on a third continuing with the same dosage of blood and bone plus sulphate of potash. This will give a clue as to whether it would be profitable to feed more nitrogen or potash. Then to a fourth plot a higher dosage of blood and bone might be applied, to a fifth a higher dosage of blood and bone plus sulphate of ammonia, and to a sixth the higher dose of blood and bone plus sulphate of potash. The returns from these latter three plots in conjunction with those from the former three would give a clue whether heavier dosages would be profitable.

Of course, one can only hope to arrive at the approximately right mixture and dosage, and because conditions vary, the only intelligent way to use fertilisers on fruit trees is to keep indicator plots going continually to act as a guide.

Bulky Organic Manures.

The findings in relation to applications of bulky organic manures are even more interesting than those concerning the application of concentrated fertilisers:

The citrus experiment station field trials (Rubidoux plots) have emphasised the fact that concentrated nitrogenous fertilisers used persistently without bulky organic material will not permanently maintain healthy citrus trees under the conditions which prevail at Riverside. Casual field observations the State over bear out this conclusion. Groves are occasionally successfully managed for as long as ten years with almost all the fertilisers applied in concentated form. The day of reckoning, however, is sure to come. In the writer's observations there are a score or more of groves that at one time were looked upon as "show places," but that have since deteriorated rapidly through failure to recognise this principle.

Instances are not difficult to find in this State, especially in our coastal districts, where our most successful citrus growers have carried out the practice of making liberal application of bulky organic manure at fairly frequent intervals. It has been demonstrated by field trials carried out by the New South Wales Department that in some soils exanthema of citrus trees can be corrected by comparatively light dressings of farmyard manure. Moreover, the beneficial results from soiling are probably, to a large extent, due to the humus that is introduced by the fresh soil carted on. The question is a vital one, because if bulky organic manure is essential to the successful growth of citrus fruits, then the extension of production is limited in proportion to the supply of this class of manure. The supplanting of horse traction by motor power is certainly reducing the supply of one class of bulky organic manure.

It is evident that in California lucerne hay is quite commonly used as a manure, and at times when it is low in price, and where supplies are not too far distant from the orchard, it would be well worth giving it a trial here.

Green Manure Crops.

The question of supply of bulky organic manure naturally prompts the thought of green manure. In the Californian survey under review the results from green manure were considered from two aspects: (1) As a supply of nitrogen; (2) As a source of organic matter:

In an attempt to measure the immediate effect of winter green manuring on citrus production, the grove records were first sorted according to the amount of nitrogen applied, then each class was subdivided into cover-cropped and clean cultivated groups. The average yields were practically identical for cover-cropped and clean cultivated groves in each nitrogen class. Apparently the use of cover crops does not diminish the necessity for nitrogen applications.

In view of the fact that the major proportion of the cover crops used for ploughing under were leguminous, the above conclusion is rather surprising.

To arrive at an interpretation of the second aspect it was necessary to class records in a different manner:

The records were also divided into classes according to the amount of bulky manure used, and subdivided into winter cover-cropped and clean cultivated groups. In every case the cover-cropped group gave a higher average yield than

the clean cultivated group. The difference was greater where the smallest amount of manure was used, and became regularly less where the requirements of organic matter were better supplied from outside sources.

When the cover-cropped groves are compared with clean cultivated groves that receive 5 tons more of manure each year the average yields are practically identical. It seems probable, therefore, that the persistent use of green manure crops will relieve the growers of the necessity of applying such liberal applications of manure. It does not seem probable, however, that mature groves can be maintained in the best condition without some application of manure, even when winter cover crops are grown.

The term "manure" in the publication discussed refers to some bulky organic manure in distinction to concentrated artificial fertiliser.

At first sight the above conclusions may seem to suggest that green manuring may solve the difficulty of maintaining sufficient organic matter in citrus orchards, but the qualification at the last—"It does not seem probable, however, that mature groves can be maintained in the best condition without some application of manure, even when winter cover crops are grown"—rather dashes such hopes to the ground. And if we consider the conditions under which we are producing citrus in New South Wales it will be found that the benefits from green manuring have very similar limits here. In the first place, many of the soils on which citrus is grown in this State are low in humus to start with, so they really do not only require the maintenance of the original humus content, but an actual building up in humus.

The necessity under most conditions, for preservation of moisture, to keep the soil under bare fallow for the major part of the year tends to deplete it of humus. Quite a heavy green crop needs to be turned under to materially increase the humus in a soil, and there is no certainty of securing such a crop regularly every year. In districts where the normal rainfall is only sufficient for the fruit crop it is only safe to risk a crop for ploughing under during seasons of abnormally high rainfall. Even in districts where the normal rainfall is sufficient for both the fruit and green crop, seasons of rainfall below normal will occur when green manure crops cannot be grown. Where water for irrigation is available, of course, failure through shortage of rainfall is eliminated, but even so, failure of a green manure crop will occur at times from other causes. Then again, as the trees increase in size it becomes more difficult to raise a heavy green manure crop between them in time to be ploughed under before the end of the winter. Moreover, the land available between the trees is far less than when the trees are small, so that the bulk of the crop to be ploughed under for a given area of trees is also less.

So though it is wise where the rainfall is sufficient or where irrigation can be practised to make use of green manuring to assist in maintaining the humus of the soil of citrus orchards, it does not seem wise to depend entirely on green manuring. It will also be found that where a bulky organic manure has been applied to the soil a heavier green manure crop can be grown.

It is unfortunate that, as a rule, sufficient supplies of farmyard manure, or bush rakings, are not available, and it is therefore necessary for citrus growers to be on the watch for other sources of bulky organic manure, such as bulky residues from field crops.

It has already been mentioned that in California lucerne hay is apparently quite commonly used as manure in citrus orchards, and one western grower in this State uses the first summer cut of lucerne, which is of low quality from a hay standpoint on account of weeds, for manure in his citrus orchard. Another coastal grower rough chaffs the cornstalks after pulling the corn and ploughs them into his orchard. Doubtless the labour cost of this operation would make this an expensive manure, but there are periods when one can spare the time, though, perhaps, it would not pay to spend the equivalent in hard cash.

Rotation of cover crops for ploughing under has not been given much attention here, but the following passage is of interest, and contains a useful suggestion:—

> The experience of the experiment station on its Rubidoux plots, where winter legumes have been successfully grown for sixteen consecutive seasons, indicates that a rotation of varieties is desirable. Common vetch, melilotus, purple vetch, and horse beans have been used at various times. No single crop has been used for more than three consecutive years, and as a result the tonnage of green manure produced has always been heavy. Such rotation avoids some of the cumulative injury from aphis, mildew, and weeds, because of the different habits and susceptibility of the several crops.

The growth of summer cover crops in citrus orchards has been tried in California, but evidently with not very encouraging results:

> The number of groves recorded in the survey in which summer cover crops have been grown for a five-year period is small. Such groves received large amounts of irrigation water, and their average yields were not so high as those of clean cultivated groves receiving the same amount of water. In several instances the observation was made that the use of summer cover crops for three or more consecutive years resulted in very poor tree conditions.

Do Fertilisers Impoverish the Soil?

Although farmers in general have long ago proved to their own satisfaction that commercial fertilisers bring desirable results (comments the *American Fertiliser*), there occasionally appears an individual who suspects such material of being ruinous to land. Mr. A. W. Blair, soil chemist at the New Jersey Experiment Station, states that there is no basis for such a fear, if the fertiliser is used in accordance with approved methods.

Professor Blair calls attention to the fact that at Pennsylvania State College good yields of hay and grain have been obtained from land treated with chemical fertilisers continually for forty years. Similar good results have been obtained at the New Jersey Experiment Station in tests conducted for the last thirty years. The palm for long-time tests of chemical fertilisers goes to England, however. There, at the Rothamsted Experimental Station, 35 bushels of wheat to the acre are being obtained on land which has been treated with chemical fertilisers continuously for the last seventy-five years.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Wheat—

Bena	E. J. Johnson, Iona, Wongalea J. Lyne, Downsfield, Yenda. W. Ash, Old Grenfell Road, Forbes. S. Kana'ey, Junee. J. W. Wilson, Collie Road, Gilgandra.
Canberra	Manager, Experiment Farm, Trangie. W. G. Law, Wattle Park, Armatree. W. W. Watson, Woodbine, Tichborne. Quirk and Everett, Narrawa, Wellington. T. Jones, Birdwood, Forbes. E. J. Johnson, Iona, Wongalea. E. J. Allen, Grogra. B. J. Stocks, Linden Hills, Cunningar Cullen Bros., Bunglegumbie, Dubbo.
Clarendon	E. J. Johnson, Iona, Wongalea. J. W. Wilson, Collie Road, Gilgandra.
Currawa	W. Cameron, Heather Brae, Loomberah. Quirk and Everett, Narrawa, Wellington.
Federation	W. W. Watson, Woodbine, Tichborne. E. J. Johnson, Iona, Wongalea. J. Lyne, Downsfield, Yenda. T. Jones, Birdwood, Forbes.
Firbank	Manager, Experiment Farm, Condobolin.
Ghurka	Manager, Experiment Farm, Condobolin.
Gresley...	E. J. Johnson, Iona, Wongalea. W. W. Watson, Woodbine, Tichborne. J. W. Wilson, Collie Road, Gilgandra.
Hard Federation	Manager, Experiment Farm, Temora. Manager, Experiment Farm, Trangie. B. J. Stocks, Linden Hills, Cunningar.
Marshall's No. 3	B. J. Stocks, Linden Hills, Cunningar.
Penny	B. J. Stocks, Linden Hills, Cunningar.
Riverina	Quirk and Everett, Narrawa, Wellington, Cullen Bros., Bunglegumbie, Dubbo.
Turvey	Quirk and Everett, Narrawa, Wellington.
Wandilla	G. R. B. Williams, Gerelgambeth Ltd., Illabo.

PURE SEED—*continued.*

Wheat—continued.	
Waratah	Manager, Experiment Farm, Condobolin.
	Manager, Experiment Farm, Trangie.
	W. W. Watson, Woodbine, Tichborne.
	E. J. Allen, Gregra.
	F. Corke, Wynnefield, *via* Cowra.
	Quirk and Everett, Narrawa, Wellington.
	G. R. B. Williams, Gerelgambeth Ltd., Illabo.
	J. W. Wilson, Collie Road, Gilgandra.
Yandilla King...	Quirk and Everett, Narrawa, Wellington.
	B. J. Stocks, Linden Hills, Cunningar.
	Cullen Bros., Bunglegumbie, Dubbo.
	S. Kanaley, Junee.
Oats—	
Algerian	C. Bennett, Forbes-road, Cowra.
	D. B. Milthorpe, "Somerset," Narandera.
Gidgee	Manager, Experiment Farm, Trangie.
Mulga	E. J. Allen, Gregra.
	C. Bennett, Forbes-road, Cowra.
Barley—	
Trabut	Manager, Experiment Farm, Cowra.
	J. W. Childs, Camden.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

THE PROBLEM OF RURAL SANITATION.

THE need for as high a standard of sanitation in rural districts as in towns must be recognised if the health of the community is to be maintained, points out the *New Zealand Journal of Agriculture* The country dweller frequently selects his site, plans the layout, builds his house and farm buildings, provides his water supply, and makes provision for the disposal of waste products according to his own ideas, and not always on lines conducive to the healthiest conditions.

An important aspect of this problem is the question of sewage disposal, a subject which is discussed in a pamphlet obtainable free from the Department of Agriculture, Sydney.

SOIL CONDITION AND PLANT GROWTH.

SINCE the discovery, about the middle of the last century, of the soil constituents taken in by plants, the tendency has been to place too much reliance on the chemical nature of soil rather than on the physical, but recently, as our knowledge of the chemical side has improved, the physical side is demanding more and more attention. It has been established beyond all doubt that if a soil contains all the elements required for successful plant growth, the plant will not thrive if the physical condition of the soil is bad. A young plant may be likened to a child. A child, however well nourished, will not grow up a healthy adult if brought up in unhealthy surroundings . . . A seedling must have open soil through which the air and water have a suitable circulation. B. L. SOUTHERN, in the *Journal of the Department of Agriculture, Western Australia.*

Poultry Notes.

March, 1927.

JAMES HADLINGTON, Poultry Expert.

The work mentioned for last month will still require the closest attention, and, in addition, the preparations for the coming breeding season should be kept in view. March is not too early to make a start to look out for new breeding stock where such is required, and there are but few farms where some is not more or less necessary.

During this and next month the egg-laying competition will be concluded and shows will be held, which will bring poultry-farmers in contact a good deal, and opportunities will occur for comparing notes and arranging for new stock. It is not always a good plan to purchase winning birds on the assumption that a win at a show or in a competition is the sole qualification required. Such purchases are often good advertising, but they may not be equally good in respect of results in the breeding pen; and it is the latter that is of the utmost importance to the reputation of the breeder and the stability of his farm. The seasoned breeder knows only too well the pitfalls open to him. What are known as "fluke" specimens often win at shows or in competitions. That is to say, such specimens as do win or get well placed are not always the result of sound breeding or representative of the skill of the breeder. It is therefore always advisable when purchasing birds for actual stud breeding purposes to inquire into the antecedents of the stock from which the bird or birds are bred, and the class of birds that form the family to which they belong.

As far as poultry is concerned, pedigrees as usually quoted may not be worth the paper they are written on, for the simple reason that there is no one other than the vendor to verify either the quality or the performances. In other words, no authorised standard stud books are kept in connection with poultry, as is the case with horses, cattle, sheep, pigs, &c. The explanation is simple. The animals mentioned are bred monogamously, *i.e.*, by pairs, and absolutely reliable pedigrees are possible. Not so with poultry, which are bred polygamously, *i.e.*, one male to so many females, mated together.

Out of this will probably arise another question: why not breed the best specimens monogamously and ensure pedigrees as in the case of other stock? But it is obvious that to breed poultry in any other way than in pens of a number of females to one male involves more manipulation than the average poultry-farmer (or even the stud breeder) will, or can, generally practise. In actual farm-breeding operations pairs, as a rule, give the worst results in (*a*) fertility, (*b*) strength of chicken, and (*c*) laying of the female, so that in this class of mating the very foundations of all requirements are

sapped in the first act. True, single-pen testing of hens and of matings are practicable by manipulation in changing the male bird from pen to pen, as is done in fecundity experiments, such as are being carried out at Hawkesbury Agricultural College. But the amount of work involved in marking and recording individuals is so enormous as to practically preclude its adoption on the farm, and unless practicable there the ultimate results are lost in obscurity. Then, again, even from single matings there are many degrees in quality and in egg-laying capacity from the same parentage, and for the most part the best specimens would be of such value as would almost prohibit their general use on the farm.

Apart, however, from such highly scientific breeding, there are good, indifferent, and bad flocks, according to the amount of skill and consistency put into selection, breeding, rearing, and feeding in one's general operations. Such skill as constitutes good work on a farm is manifest, not in odd specimens, but in the general conformity of the flock to a uniform standard of size, type, and character. The existence of these is a sign of careful and skilful breeding, whereas a mixture of types and characters denote lack of the breeder's skill.

These hints should be some guide to the uninformed in these matters. If every utility poultry-farmer made a study of the breed he keeps, sufficient to enable him when purchasing birds to make good selections for his breeding-pens instead of trusting too much to advertised performances, a great change for the better would soon come over the poultry industry, and it would become a more remunerative occupation.

Avoid Early Matured Birds.

One of the greatest mistakes made in choosing breeding stock, whether on the farm or by way of purchase, is the selection of too early maturing specimens. It is quite a common thing to see a batch of early-matured, precocious-looking birds selected as breeding stock, while more robust, slower maturing, but better-grown birds, are rejected because in the mind of the uninformed farmer they appear less likely layers or sires, as the case may be. In this connection "growth and maturity" are not synonomous terms. For instance, one bird might be fairly well matured and commence laying at four and a half to five months old, and yet be very much undersized; while another bird continues to grow and does not mature until a month or six weeks later. The latter is the more desirable bird in every way to breed from. Small, quick-maturing birds might answer all the conditions required in a layer, or in a sire of layers, but all the same they are the bane of the poultry industry. The continued selection of this class of bird as breeders is the surest way to produce a degenerate flock, with its train of evils—constitutionally weak chickens which are difficult to rear, and too many medium to small eggs. Instead of four and a half months' layers being hailed as a blessing, they should be regarded as the greatest curse on the farm. No farm is perhaps entirely free from a portion of them, but to deliberately augment their numbers by breeding from them is the

height of folly. If the farmer would only bring weights to bear in his selection of breeding stock, he would automatically eliminate these early-maturing specimens from his pens. It cannot be too strongly emphasised that weight should be one of the prime factors in choosing breeding birds.

The weights desirable for breeding in the various breeds have been published from time to time in these notes, but their reproduction here is necessary to complete our advice on the subject in view of the approach of the breeding season.

Desirable Weights.

The following weights should be insisted upon for breeding stock:—

White Leghorns, cockerels, at least 5 lb.
,, cooks (over 12 months old), 6 lb. to 7 lb.
,, pullets, 4 lb. to 4½ lb.
,, hens (over 12 months), 5 lb. to 5½ lb.

Orpingtons, cockerels, 6 to 7 lb.
,, cocks, 7 to 9 lb.
,, pullets, 5 to 6 lb.
,, hens, 6 to 7 lb.

Langshans, Rhode Island Reds, and Wyandottes should have similar weights to those of the Orpingtons.

Avoid too Close Breeding.

Whatever theories might be propounded from time to time on breeding for egg-production per medium of mating close relatives, the fact remains that close in-breeding (unaccompanied by a breeder's skill—and almost genius—in selection) is the road to ruin. The farmer who is not well informed in these matters is safer by far to avoid close breeding, and to go in for outcrossing, by which is meant crossing two strains of the same breed. Close in-breeding and the selection of early-maturing birds to breed from are the two main causes of small eggs, though there are other subsidiary factors, of which food deficiency is a frequent one.

During the recent high cost of feeding, there has been a strong temptation to substitute too much green food for more substantial fare in the morning mash, and several cases of falling off in size of eggs have lately come under notice. These were cases where in the earlier months of the laying period normal to large-sized eggs had been produced by the same flocks, but the reduction in size was so marked as to cause the farmers concerned to seek an explanation.

The Small Egg.

There is no State in the Commonwealth in which more attention has been paid to size of eggs than in New South Wales. It has been a condition in the Hawkesbury Agricultural College Egg-laying Competition almost from its inception, and there is no doubt that the general bulk of eggs marketed in this State compares more than favourably with those produced anywhere. Our entry into the world's market with an exportable surplus of 70 per cent. of the eggs shipped from the whole Commonwealth makes it more than ever

necessary that our efforts be concentrated on the production of good-sized eggs. This can only be attained by strict attention to all the factors mentioned above.

Chicken-pox (Warts).

During this and next month chicken-pox is generally prevalent. If the advice tendered from time to time in these notes is faithfully followed there should be little or none of it to worry about, but a hint as to what to do may be seasonable.

The main thing where the disease has got into the flock is to make an effort to dry up the sores and allay the irritation. For this purpose there is nothing better than tincture of iodine, used as a paint, with which the sores are lightly touched. Where the sores have got into the eyes the iodine is too severe, and ordinary laundry blue can then be used with good effect. Medicines are not of much use once the disease has broken out, and it will usually run its course in about three weeks.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1927.

Society and Secretary.		Date.
Yass (E. A. Hickey)	March	8, 9
Glen Innes (G. A. Priest)	,,	8, 9, 10
Bangalow (W. H. Reading)	,,	9, 10
Cooma	,,	9, 10
Taree (R. Plummer)	,,	9, 10, 11
Luddenham (J. McKnight)	,,	11, 12
Granville (B. Hyslop)	,,	11, 12
Macksville (W. G. Hughes)	,,	15, 16
Batlow (C. S. Gregory)	,,	15, 16
Armidale (A. McArthur)	,,	15 to 18
Cumnock (K. J. Abernethy)	,,	16
Nimbin (S. H. Kilminster)	,,	16, 17
Eden (H. P. Wellings)	,,	16, 17
Gundagai (N. W. Holman)	,,	16, 17
Bemboka	,,	16, 17
Bombala	,,	16, 17
Nabiac	,,	17, 18
Taralga	,,	17, 18
Mendooran (F. R. Mason)	,,	18
Campbelltown (W. N. Rudd)	,,	18, 19
Queanbeyan (A. O. Manns)	,,	18, 19
Blayney (J. H. Moore)	,,	22, 23
Molong (W. P. Stanger)	,,	22, 23
Coonabarabran	,,	22, 23
Nimmitabel	,,	22, 23
Tamworth	,,	22, 23, 24
Crookwell	,,	22, 23, 24
Coraki (J. Allison)	,,	23, 24
Kempsey (N. W. Cameron)	,,	23, 24, 25
Tilba (R. L. Hapgood)	,,	25, 26
Bulladelah	,,	25, 26
Quirindi (G. Curtis)	,,	29, 30, 31
Orange (G. L. William)	,,	29, 30, 31
Cathcart (R. A. Stewart	,,	30
Camden (G. V. Sidman)	,,	31, Apl. 1, 2
Goulburn (F. D. Hay)	,,	31, Apl. 1, 2
Stroud	April	1, 2
Muswellbrook (R. C. Sawkins)	,,	6, 7, 8
Brookvale	,,	8, 9
East Gresford	,,	8, 9
Sydney Royal (G. C. Somerville)	,,	11 to 20
Liverpool (R. C. Fitzpatrick)	April	22, 23
Dorrigo (J. H. Skeoch)	,,	27, 28
Gloucester	,,	27, 28
Narrabri	,,	27, 28
Bathurst (N. B. Richardson)		27, 28, 29
Forster (W. Poppenhagen)	,,	29, 30
Wellington (A. E. Rotton)	May	3, 4
Wingham (D. Stewart)	,,	4, 5
Grafton (L. C. Lawson)	,,	4, 5, 6, 7
Windsor (H. S. Johnston)	,,	5, 6, 7
Dubbo	,,	10, 11
Warialda	,,	11, 12
Dungog (W. H. Green)	,,	11, 12, 13
Coonamble (J. C. Wilson)	,,	18, 19
Narromine	,,	18, 19
Ulmarra	,,	18, 19
Casino (P. W. W. Manson)	,,	25, 26, 27
Bonalbo (W. G. E. Johnston)	June	8, 9
Illabo	Aug.	17
Wagga Wagga (F. H. Croaker)	,,	23, 24, 25
Cootamundra	,,	30, 31
Grenfell	,,	30, 31
Lake Cargelligo	,,	31
Young	Sept.	6, 7, 8
Ungarie	,,	7
Ganmain (C. C. Henderson)	,,	13, 14
West Wyalong	,,	13, 14
Cowra	,,	13, 14
Albury (A. G. Young)	,,	13, 14, 15
Murrumburrah	,,	20, 21
Canowindra	,,	20, 21
Temora	,,	20, 21, 22
Boorowa	,,	22, 23
Barellan	,,	28
Harmodman	,,	28
Hillston	,,	30
Ardlethan	Oct.	5
Quandialla	,,	6
Narrandera (M. F. Murray)	,,	11, 12
Ariah Park	,,	12
Griffith	,,	18, 19

Orchard Notes.

March.

W. J. ALLEN and W. LE GAY BRERETON.

THE growers of the late deciduous fruits in the inland and tableland areas will still be employed harvesting their crops. This and the common storage of apples were dealt with in last month's notes.

In respect to common storage, attention might be drawn to the open store shed. It has been noticed both at the experiment farms and in private orchards in cool tableland districts that late-keeping apples, such as Granny Smith, when stored in the open, but protected from the rain, and situated, on the cool side of a building or a cutting on the side of a hill, or protected by thick tall trees so that the sun never reaches the stack of cases, the fruit keeps in fresher condition than apples picked at the same time and from the same block of trees, but stored in a walled building. A comparatively cheap and cool open shed can be constructed of rough timber, giving only a slight pitch to the rafters; then across the rafters place saplings (boughs and all) close together. On this place a thick covering (5 or 6 feet deep) of straw, piling the straw higher at the ridge to throw the water off and then thatching the whole. The shed should be high, so that the lowest part does not come closer than within a couple of feet of the highest cases of apples in the stack. If the shed cannot be given sufficient eaves (which is preferable) to prevent the sun from striking on to the cases stacked within, a thatched screen should be placed on the side or part of two sides to protect them. The cases should not be stacked close to this screen, but a foot or so should be allowed to admit of a current of air. It is a great advantage to have the shed protected from the sun by tall thick trees or a high, steep hill. As protection from mice or rats, a cage or safe of fine-mesh wire (or, better still, wire gauze, as the latter will be helpful in moth control) should be built inside the shed. The netting or gauze should extend over the top, and the floor would also need to be rat or mouse proof to prevent burrowing underneath.

As pointed out in last month's notes, it is most important that fruit picked during the heat of the day should not be stacked till cooled off. It will be found to cool off best if left in the open overnight. To do this, it can be stacked in the shade in a very open temporary stack and only placed in the shed early the next morning before the sun strikes it.

Pests.

Fumigation can still be successfully carried out for scale on citrus trees. As a rule, during the busy part of the fruit season woolly aphis is necessarily neglected, and a thorough clean up of the trees given as the foliage thins out in the autumn. But no grower can afford to neglect any seasonable detail of codlin moth control, even during the busiest part of the fruit season.

Cultivation.

In our drier districts, where the normal rainfall is only about sufficient for the trees, and where water for irrigation is not available, it is not wise to sow a green crop for ploughing under. But it is a good plan to give an early autumn ploughing, leaving the land in the furrows so that it will allow any rain that falls to soak in quickly.

As the days are shortening and the sun is not so fierce, evaporation becomes less and cultivation can be eased off. In districts of ample rainfall, or where irrigation can be practised, leguminous green crops, such as field peas or tick beans, can be sown as a green manure crop.

Preparation for New Plantings.

If the land intended for new planting is in fit condition for ploughing and subsoiling, it is a good plan to have the work done as early as possible, as moisture is thereby conserved. The soil is also put in a condition in which it will absorb any rains that fall, and thus no hold-up will occur at planting time through the land being too dry.

Fodder Conservation an Essential Adjunct to Dairying.

It is often a debatable point as to whether breeding or feeding is the more important from the production point of view . . . to get the best results, both intelligent breeding and feeding are essential. True it is that the best cow in the world could not produce without suitable food, and also that if a cow has not the inherited tendency to produce milk in large quantities, all the feeding in the world will not make of her a high producer.

The application of this truism must immediately bring home the fact that to obtain the best results a sufficient supply of feed should always be available, and if the natural conditions are such—and unhappily, this is usually the case—that there is likely to be a scarcity of natural pasturage during certain times of the year, it is practically essential that the question of storage of fodder, either as hay, grain, or silage, must be considered as a necessary concomitant to successful dairying, in the same manner that manuring, fallowing, and rotation are considered essential for successful cropping.—H. B. Barlow, Chief Dairy Instructor, South Australian Department of Agriculture.

Too Many Varieties.

What is apparent to all fruitgrowers is that the demand for some varieties is much greater than others. It is also apparent that if 75 per cent. of the varieties of apples and pears in cultivation to-day were eliminated it would be greatly to the benefit of the industry, the trade, and the public. Most of these innumerable varieties owe their existence to the individual fancies of the growers who planted them, and most certainly not to their commercial utility.—H. V. Smith, at the Agricultural Bureau Conference at Orange.

VOL. XXXVIII. PART 4. APRIL 1, 1927.

Agricultural Gazette of New South Wales.

Australian Products in Oversea Markets.

REPORTS BY THE HON. W. F. DUNN.

[Concluded from page 193.]

AUSTRALIAN CANNED GOODS.

CANNED FRUITS.

As a result of my investigations overseas, I can with pleasure state that a keen discrimination has been manifested in Australia in the matter of selection of varieties of fruit of all kinds intended for export. I can further, with confidence, state that no blame whatever attaches to the grower, for Australian fruit generally is admitted the equal of the best obtainable anywhere—in the raw state. My eulogies, however, begin and finish there. The old adage that "God sends the food and the devil sends the cooks" very nearly expresses the result of my careful inquiries into the disabilities we suffer under when facing competition in the British markets.

The average grower contributes everything required of him towards meeting the British market's demands, but from that stage to the point of landing the goods in Britain we have nothing to be proud of; on the other hand we have much to chide ourselves for, since our methods of packing can be summed up as nothing short of crude and slipshod. I propose to justify this harsh statement, and the best and most practical way, though perhaps odious, is by comparison.

Selection (Grading.)

Let me commence with selection (grading). I have "cut" a can of Australian dessert peaches and other fruits, and found halves of most perfect fruit mixed with others of similar quality, which have been bruised, and this portion, having been cut away, leaves the contents very uneven; the whole pack thus suffers by comparison with foreign samples. Again, under-ripe fruit and green butts are frequently found in a can of otherwise well-graded fruit.

On the other hand, when a can of Californian has been "cut," each and every half of the fruit has been a perfect specimen. The Californian best grade canned fruit, to my mind, has no peer at present, but I am satisfied that with the same meticulous care and attention manifested in the important department of packing, Australia can easily hold her own with California, and moreover obtain as good a price for her produce, once confidence is established.

Grading of canned fruit in California is carried to a fine point of perfection, as witness the following gradings:—

(1) "Fancy."—Superlative quality and generally specimen fruit in heavy syrup.

(2) "Choice."—Similar to the first named, hardly as large, but perfect.

(3) "Standard."—Well-graded fruit, free from blemish, but lighter syrup.

(4) "Seconds."—Of poorer quality, but well graded and lighter syrup still.

(5) "Water."—Similar to "Seconds," but fruit packed in water.

(6) "Pie,"—Over-ripe fruit, free from bruises, under-ripe fruit and culls packed in water.

Desert berries, such as raspberries, &c., are generally graded as "Choice," "Fancy" quality being reserved for the harder fruits that will not "mush" and will invariably turn out perfect.

Containers.

Now as to containers; the greatest care and attention is paid by the Americans to this very important feature. The leading brands of berries and fruits are packed in what is known as the sanitary can. Instead of the interior being white, it is of a pale golden colour. Peaches, pears, and other similar fruits are generally packed in what is known as "two and a halves," but "Fancy" and sometimes "Choice" are in "threes," with berries in "twos." Additional to this, these fruits are packed also in "individuals" (ones) for certain trade, both "talls" and "flats," sufficient for a dessert for two, which is very economical.

Gold lacquer of good quality and pale colour lacquering, carefully done, is the rule, for the outside of tins of Californian. This enhances the appearance of the can, and when goods have to be kept any length of time helps to prevent "pitting" of the cans and consequent loss.

Labelling.

Where California is profligate in her attention to this feature—a most important one, and short of quality the greatest asset to the shopkeeper—Australia, I should say, in comparison, considers it hardly worthy of notice. Take any of the leading American brands; for instance, that of the Californian Fruit Canners' Association; the labels used are worthy examples of the artists' and lithographers' art. Our productions in this department can be given no better appraisement than an attempt from a kindergarten. The Californian packer realised that after lavishing all the care and attention on the contents of the can, he must have his goods attractive for the shelves, realising that the label (with the quality behind it) plays a great part in selling the goods. He carries this latter feature to the point that he even takes into consideration the effect of the sun on colouring of the labels, realising that exposure to the light fades them; consequently he seeks depth of contrast in his colour scheme.

His recognised agents, again, are kept supplied with new labels of all his grades and varieties, enabling the latter to strip labels that have become soiled for various reasons (sometimes as a result of coming into contact with "blown" cans, the juice from which soils some of the contents of the case in which the "blown" has been found). With a view to giving further protection in this direction some of the best canners neatly wrap each can in a kind of waterproof paper known as "parchmyne," a paper of stout body having the appearance of a thin tracing paper. I am satisfied that all this attention to detail is the key of the Californians' success.

Cases.

We are not as happily placed as California for timber, and consequently we labour under a disadvantage, but I am satisfied that all the attention possible is not given to casing and branding, as in California. The American cases alone are a greater advertisement. Made of clean white wood, the brand is burned cleanly and deeply in on each end of the case, generally monopolising the whole of both ends, while the shipping marks on the tops of the cases are small but cleanly stencilled, and, above all, neat. Make your own comparison of these details with our own export cases.

Lastly the strapping. Wiring has its advantages, but strapping (hooping) to my mind is preferred by the shopkeeper. It is easier to take off, permitting him to empty the cases without in any way disfiguring them—a feature, since he sometimes uses them to deliver or rail away groceries, or alternately sells them: the case still remains an advertisement.

Show Cards.

The leading packers supply beautifully illustrated booklets, showing brands and giving full particulars of their different packs with a view to educating the grocer, and they also issue to clients, through the agents, attractive show cards. Small tins loaded with sand, the size of a large cotton reel, is an idea which has been used for advertising purposes. These are exact reproductions of the commercial package. Given to customers, they generally find their way into the nursery for the children to play "shop" with, which idea carries its own suggestion.

I could go on at length, but I think I have said enough to merit your thinking that we have much to do before we can compete on an equal footing with our competitors in California.

BOTTLED GOODS.

Perhaps the "fifty-seven varieties" are the best example of how to pack bottled goods. Our packing and get-up, generally speaking, is the finest example of how not to do it. The most creditable display I have seen is in Australia House, and that, I believe, the product of one firm.

As an instance of the care the Americans take, mention may be made of their catsup. The innocent little label round the neck of the bottle would appear to be sheer waste of time and money. But that "necktie," as it is called, plays a great part in the selling of the bottle, for it screens from the eye the discolouration of the catsup which has dried along the top of

the neck, the result of handling of cases in transit—a detail, but a most important one. The neatness of the cases is again evident with bottled goods: dovetailed, of clean white wood, and inside the whitest of sawdust, and again the parchmyne paper round each bottle. The sanitary cap that strips off is used in some cases, and in others the screw-top, bright and shining.

CANNED MEATS.

Many of the drawbacks mentioned in connection with canned fruits apply to this department also; they include bad lacquer, execrable colour schemes and designs, and distinctly bad lithographic work; cans battered, either due to careless handling at works or in transit or both, sometimes due to "play" in the cases, the result of the latter being made too large (this remark applies also to the cans); sloppiness of contents (careless packing); too much fat; lack of discrimination in the class of meat; presence of hair at times; ox cheek meat in corned beef; careless processing, such as insufficient sterilisation and soldering of seams; irregularity of quality; sometimes short weight; sloppiness continually reported in canned tongues, with too much "root" packed in comparison with American and New Zealand packs. There is room for great improvement here.

CONCLUSION.

I trust that this report will be regarded as one of constructive criticism, and that it will be recognised that my only object in expressing so forcibly my opinions in connection with these matters is to bring about an improvement which will enable Australia to take her place in the world's markets.

DISTRIBUTION OF AUSTRALIAN CANNED FRUITS IN THE UNITED KINGDOM.

Extensive inquiries were made into the methods of distribution of Australian canned fruits in the United Kingdom, and as to the possibilities of extending the market therefor. The problem was approached from the following aspects:—

1. Direct sales to consumers.
2. Direct sales to retail shops through a Government-owned or controlled organisation.
3. Direct sales to retail shops through existing wholesale merchants.
4. Sales to multiple stores.
5. Sales through brokers.

Direct Sales to Consumers.

In order to make direct sales to consumers it would be necessary for the Government or the Water Conservation and Irrigation Commission to obtain control of a large number of retail shops in various parts of the United Kingdom, either by purchase of a controlling interest in an existing

organisation or by the opening up of new shops. There are organisations of this kind here in the grocery and also fresh meat trades. Probably the largest grocery multiple stores organisation, with its subsidiary companies, controls about 1,200 to 1,400 shops in Great Britain. This highly organised institution trades in all classes of grocery and provision merchants' products, is capitalised to the extent of £2,400,000, and is valued now at approximately £6,010,625.

This will probably convey some idea of the immensity of its interests and the problem which would require to be faced to either obtain a controlling interest in it—if such were even possible—or copy it. To attempt to do so with canned goods only, even if the whole of the Australian pack were available, would be manifestly absurd. Even with the aid of the allied goods generally exported from Australia, *e.g.*, dried fruits, butter, honey, cheese, fresh meat, &c., taking into consideration the present state of their development, limited production, irregular supplies, cost of production and transport, the question is hardly one to which to my mind can be seriously considered as a commercial proposition.

Such a venture, requiring as it would enormous capital, intense organisation, years of continuous and unceasing effort, ample cold and other storage space in London and the provinces, and super management, could only be regarded as a foolish and dangerous experiment. I cannot recommend it as a reasonable business venture, or a possible solution of the problem of marketing canned goods.

Direct Sales to the Retail Trade through a Government-owned or Controlled Wholesale Organisation.

As an objective, a scheme of this nature is more worthy of serious consideration than any attempted direct selling to the public; both require large capital—the latter a prodigious amount—and infinite capacity for organisation. To obtain control of an existing organisation or to inaugugurate a new one would, it is estimated, require not less than £100,000; the amount would naturally depend on the extent of the ground it had to cover and the variety of goods it is to handle. It would need its own warehouses and means of transport, a large number of well-paid travellers, a head office, and a large staff of clerks to keep accounts.

At the outset it may be definitely stated that such an organisation handling canned goods alone—or even allied, as it must inevitably be, with several classes of other primary products exported from Australia—would be, to use the terms of one prominent business man vitally interested in Australian goods alone, "inadvisable and impracticable, and sure to make a heavy loss." Indeed, no broker, merchant, or trader can hope to succeed by carrying one or even a few highly competitive lines like canned fruits: the overhead charges would be too heavy to be borne. Such expenses are only practicable when spread over many lines. If such an organisation were not already a wholesale grocery and provision business it would rapidly develop into one, and would of necessity have to carry many lines, the majority of which would not have any interest for Australia. It is

conceivable that in order to meet the varied demands of its customers, an Australian controlled house would be compelled to deal in some of the goods of its competitors, even American canned fruits, for many grocers, in order to meet their customers' requirements, must carry these, and it is essential for a wholesale house to be in a position to supply the whole of its customers' wants, however varied: otherwise it runs the risk of competitors doing so. It is comparatively easy for travellers to carry a number of lines, and it is only by doing so that the overhead charges against individual lines can be made a commercial proposition.

A wholesaler must also allow extended credit, and he runs the risk, and must carry the burden of bad debts. Each issue of the *Trade Journal* discloses numerous failures amongst retail grocers. It is to cover those risks and arrange for distribution that there is a difference of approximately 1s. per dozen between the price of canned fruits to the wholesaler on the one hand and the retailer on the other.

It is particularly worthy of note here that up to the present very little has been done by the large American canners to cultivate this class of direct trade, though special inquiries towards this end have been made and one or two initial experiments tried, only to be abandoned later. Several wholesale provision houses dealing with canned meats, sauces, condiments, and such like have carried and still carry lines of canned fruits with their meats, but no great fruit canners are attempting such class of trade. They prefer the prompt settlements of the wholesaler to the delays and uncertainty of the retail trade already referred to.

It is very essential for a wholesale house to carry sufficient stocks to supply its customers as and when required: consequently stocks of chief lines, *e.g.*, canned fruits, &c., must be large enough to ensure continuity of supply, and, above all, must be available when required, otherwise grocers will be induced to transfer their business to a house on which they can rely, and which is not liable to be periodically short of its chief lines. It is a fact that Australian goods are notorious for being irregular in supply from year to year, and this is fatal to organised trading, such as would be demanded by a wholesale organisation. The fact that these periodic shortages may be due to drought or any other cause does not affect the resultant hostile attitude of the grocer whose trade has suffered and whose customers have been thus inconvenienced.

To sum up, it is questionable whether a canner who may obtain a better price by selling wholesale in this way would gain more in the end than by letting the ordinary trade take these risks. He would assuredly have the uncertainty as to final realisations which would result until each pack had been disposed of, whereas by using the trade generally as his medium of distribution he is likely to learn within a reasonable time where he stands financially from the season's operations.

Among others interviewed, I invited one broker of very good repute and with a quarter of a century's experience in London in this trade, and interested only in Australian produce, to consider whether he would be

prepared to co-operate in such a business as I have outlined, sharing expenses, &c., and he, without hesitation, refused to entertain it, remarking, as I have already indicated, that "whilst it was not impossible, it was certainly inadvisable and impracticable, and sure to entail heavy loss." This merchant's principals have already approached him along the same lines, and although prepared to carry out such a trial if instructed to do so, he had already advised strongly against it.

Direct Sales to Retail Shops through Existing Wholesale Merchants.

In considering this aspect of the matter it is assumed that any merchants who are likely to be considered are already in a sufficiently large way to ensure that they have established connections and a numerous clientele on their books, and are also prepared to guarantee their accounts. No other class of merchant should be seriously considered. The relative merit and status of the firm being established, there is no doubt that it is possible to carry on in this way. It must, however, be borne in mind that this course will close all other channels of trade to us. As a matter of fact, all other traders, *e.g.*, retail grocers, wholesalers, and brokers, become propagandists against one brand of canned fruit if this method of disposal is adopted.

In the course of my inquiries I interviewed the principals of several wholesale distributing houses, and whilst the number of firms eager and willing to handle our business is large, I am definitely of opinion that the number which could and would do it effectively without the aid of brokers is very small indeed. When pressed on the point, many of these firms said they must reserve to themselves the right to use all existing trade channels, including brokers, for the disposal of any goods entrusted to them. This, in itself, is a grave weakness, for other wholesale firms will not hasten to buy, even through brokers, a line which is being carried to certain of the retail trade by a competitor; in practice they will only buy it under dire necessity and to meet specified requests for that particular brand by their own customers.

In committing itself to this class of business, a distributing house of any standing generally requires the canner to enter into a long-term agreement, confining itself to use the firm exclusively for a particular mark or brand; to guarantee the continuity of supplies at competitive prices, irrespective of the cost of manufacture; to keep the quality up to the average of similar goods from other countries; and probably during the early years give him support with an advertising campaign. The commission payable on this class of business, viz., 5 per cent., is double that usually charged by brokers; as an offset against this it is claimed, however, that higher prices will be realised. This increase in price is hypothetical and may be all absorbed if advertising is insisted upon; no trader would give any estimate of the probable increase in price, whereas it is certainly a conservative estimate to say that the extra commission and advertising would cost 4½d. per doz., and the final realised price would be accounted for to the canner after much longer delay.

I do not know of any wholesale firm which would trade exclusively in canned goods of one brand; each large house specialises in canned fruits, carrying its own label. Several American canners cater for this trade and will affix the wholesaler's label in the cannery. This system may help a canner to sell fruit, but it certainly brings no goodwill to his own brands.

If the export output of a cannery were to exceed 100,000 cases per annum, it is extremely doubtful if any house could sell all to the section of the retail trade which it supplies, and the aid of brokers would then be invoked. If, however, the output is of smaller dimensions, intensive effort on the part of a suitable wholesaler should meet with a measure of success, but continuity of policy, quality, and supply is absolutely essential.

Sales to Multiple Stores.

As multiple stores sell direct to the consumer, direct sales to them should be an ideal way to dispose of canned fruits, and theoretically they should be prepared to pay a higher price for the goods, as no middlemen intervene. This, however, they rarely, if ever, do. In practice, the large multiple store organisations in England are such large buyers that they can deal direct with brokers, and thus eliminate the merchant; they therefore will only buy at bedrock prices from the brokers, and can thus undersell the average retail grocer who purchases from a wholesaler.

They will also deal with the canner direct, but being keen buyers, will only do so when the canner's price is lower than the price they can obtain the same goods for from the broker. Unless they are certain the purchase from the cannery direct is on very favourable terms they prefer to purchase from the broker, as in this way they secure minimum requirements on the spot from time to time, whereas by direct purchase from the canner they are compelled to hold large stocks which are a continuous source of expenditure for interest, storage, depreciation, insurance, &c. The wholesale trader, while he must of necessity accept this state of affairs, does not do so with a great deal of grace; consequently if any brand is featured by the multiple stores, the ordinary grocer will avoid it because he cannot compete in that article at the price, and he will be encouraged in this attitude by the wholesaler, and will become a propagandist against that brand of canned goods. As there are some 90,000 grocers in the United Kingdom, this is a very important point to keep in view. The brokers and wholesale houses in this country have already indicated their displeasure with this direct trading with the multiple stores, and if a change of method is contemplated in the future, this prejudice will have to be encountered.

If the Australian brands become associated alone with multiple stores and any goodwill is created, the stores will be in a favourable position to bargain very keenly for lower prices at the beginning of each season, and the canner may be thus manoeuvred into the unhappy position of not

having an alternative market, or being compelled to sell on an unfavourable or artifically deflated one, due to the absence of interest in the brand by the trade channels generally, or to their organised and open hostility.

The multiple stores, although a prominent and growing part of the grocery trade, as yet influence only a minor portion of the trade in canned goods. Their business is in the cheapest lines, thus generally they only contract for standard goods, leaving the choice and fancy grades to the canners to be disposed of on a market which is already prejudiced and unfavourable to the brand because of its association with the multiple stores. For example, if a multiple store in a town features "Ibis" goods, the adjacent competitor who cannot purchase that brand so favourably, or not at all because it has been cornered by the multiple stores, will only stock other brands with which he can compete with "Ibis" goods.

Sales through Brokers.

The supporters (and so far as the canned fruit trade is concerned they are very important) of this class of business claim to be able without prejudice to their goods in any quarter, to sell to all wholesalers and the large multiple stores, and thus cover the whole range of possibilities so far as the market is concerned. They will not sell direct to the retail trade—with the exception of the multiple stores—because such a proceeding would necessitate financing the grocers as well as antagonising the wholesalers who have built up this trade. Grocers are given up to three months' credit, and each trade gazette reveals in its bankruptcy columns how risky this financing is becoming for the wholesaler.

From the canners' point of view the merit in this method of doing business is that the purchase price is paid promptly, and finality generally reached before the next season's pack is commenced. If the quality of the pack remains consistently good a wide distribution in course of time should be assured and a goodwill created. The better class of brokers charge not less than 2½ per cent. commission and guarantee their accounts.

Many inquiries and Royal Commissions have been held in Great Britain during recent years into marketing methods for many types of primary produce, and the findings have invariably resulted in the opinion that the broker fulfils a desirable and essential part in the commercial structure of the country.

I commenced my inquiries convinced that the brokers were unnecessary and a burden on the industry, and that they should be eliminated at the earliest possible moment. I still hope that trade practices will so evolve that this desirable ideal will be possible in the future, but I am afraid that trade customs and traditions have firmly established the brokers in all classes of foodstuffs, and nothing but comprehensive organisation along co-operative lines by the producers will ultimately provide a solution of this and other obvious instances of overlapping.

The largest American canners without exception, so far as I know, avail themselves of brokers to do their business in the United Kingdom. Although I cannot quote concrete instances, as these matters are generally inquired

into confidentially, I am reliably informed that several American organisations have sent highly qualified groups of men to inquire into the possibilities of more direct trade, but no change has ever been effected.

The Californian Packing Corporation has commenced this year an advertising campaign to develop the trade in an already well-known brand of canned fruits. The expenditure will probably amount to £50,000, and the canners have assured the trade that all resultant inquiries will be passed on to them to be dealt with in the usual way of business. I do not know whether this scheme is anticipating any proposed "Empire Produce" advertising propaganda, but I am assured it is only an extension of the policy which has prevailed with the corporation in the United States of America during the past few years. It is interesting to note that this large sum, viz., £50,000, is being spent in this way and no effort is being made to expend it in opening up any retail or wholesale organisation. Further, it is the one brand alone that is being advertised, not Californian fruits generally.

It is reasonable to assume that had their former inquiries justified the setting up of machinery for enabling more direct trading with the consumer, this large amount would have been used as a nucleus to this end.

General.

The question is often asked whether it is not possible for an agent to sell to both the wholesale and retail trade. A broker will not—except to large multiple stores—for if he sells to retailers, the wholesale trade will not deal with him. A wholesaler can sell to other wholesalers, but in practice only does so if his competitors' customers demand the particular proprietary brand he stocks. Wholesalers generally deal in particular brands, and therefore other wholesalers will only buy when they want stock and then only if the price is low enough to compete with fruit offering by brokers. Sales thus effected only realise bedrock prices, but the wholesaler will doubtless charge his 5 per cent. commission, and the canner will get less than if the sale were effected by a broker. In other words, it will only pay a canner to allow the wholesalers higher commission if the latter sells to the retailer, and by doing so obtains a higher price than the broker can secure.

I am definitely of opinion that an effort should be made by all Australian canners to endeavour to arrive at an agreement *covering a number of years* to dispose of all their export surplus *through one channel*, and in this way eliminate bidding against one another, except on the basis of quality. Should this be impossible of achievement, two or more canners might with advantage place their export surplus in one agent's hands, and thus eliminate some of the competition now existing at the selling end.

If neither of the above suggestions is considered capable of adoption, I am unable to see any objection to a canner putting up his product under two distinct brands, and using a broker to market one brand and a selected wholesaler the other. In this way a true comparison of results could be obtained so that a future line of action may be definitely determined upon.

The Overseas Farmers' Co-operative Federations Limited gave me instances in connection with the marketing of wheat, butter, and eggs, which conclusively proved that the selling of the same commodities by a number of representatives resulted in lower prices than if the selling had been confined to one organisation, or at least within narrower limits.

Each system of selling has its merits, its limitations, and its disadvantages, and I cannot recommend any scheme which will combine the merits of two or more, except in a modified form as indicated above, by a division of the pack, and even this conflicts with the principle of selling through one channel, which should be the aim of all the canning interests in Australia. The best course can only be decided upon by reviewing the position as it is likely to develop in the future, and by understanding the limitations of each method of distribution. Modern business, especially distribution, is so difficult and complex, and on such a large scale that there seems to be no royal road to a solution of the very vexed problem of direct sales from producer to consumer.

While investigating the question as to the most desirable means of disposing of our canned fruits, a number of suggestions were made which will be of interest and can be considered by those engaged in the canning industry. The principal suggestions are enumerated hereunder:—

1. Stalks should not be removed from pears prior to canning unless the fruit is exceptionally firm. When the stalk is removed the pear breaks up, whereas if the stalk is left on, the fruit remains whole, due to the fact that certain fibres connected with it keep the pieces firm.
2. The market for sliced peaches is limited, and it is advisable as far as possible to market peaches in halves.
3. Distinguishing labels should be used for each grade.

The Value of Top-dressing.

To let his paddocks and his pastures remain in their original state means that year by year the farmer becomes bored by the dull monotony of his surroundings and by the fact that his production and profits are limited. Accordingly his occupation lacks that healthy interest which is necessary to give him pleasure. In the southern part of Victoria and in South Australia the process of top-dressing pastures has got past the experimental stage, and during recent years thousands of tons of superphosphate have been used for this purpose, demonstrating that the policy must be payable. On my own place I have experimented with a few acres that have given satisfactory results. As a result of top-dressing with 1 cwt. of ordinary superphosphate, the clovers, which seemed to derive the greatest benefit from the manure, increased in height from 4 to 12 inches, and the mass of feed generally seemed to be three times as great. The benefit on poorer soils would be comparatively greater.—J. E. Jelbart at Albury Bureau Conference.

Field Experiments with Winter Fodders.

COWRA EXPERIMENT FARM, 1926.

J. A. O'REILLY, H.D.A., Experimentalist.

THE object of these trials is to ascertain the most suitable crop for winter fodder in the Cowra district. The essential points in a crop for this purpose are its ability to stand stocking, its ability to recuperate after feeding off, and early maturity.

The usual method adopted in these trials is to fence the plots off temporarily, and as the crops become ready for feeding off to turn in a certain number of sheep, removing them when the crop has been grazed fairly close. Owing to the abundance of feed on the farm a departure was made this year, the plots being cut and made into silage. It is sound practice to sow crops each year for lambing ewes, but in a season similar to this it is more economical to convert the extra material into silage, which will be a valuable stand-by in a dry season.

The trials were sown 19th April, 1926, and the following crops were tested:—

Slav rye	60 lb. seed per acre
Sunrise oats	40 lb. ,, ,,
Lachlan oats	40 lb. ,, ,,
Gresley wheat	60 lb. ,, ,,
Skinless barley	55 lb. ,, ,,
Cape barley	55 lb. ,, ,,

The land was ploughed in July, 1925, sundercut on 29th December, and springtoothed 18th January, 1926. The harrow was used on 29th March and 15th April, and a further harrowing was given just prior to planting. The rainfall during the growing period was as follows:—April, 142 points; May, 330; June, 193; July, 190; August, 167; September, 134; total, 1,157 points. The seed-bed was in excellent condition to receive the seed and a good germination in all plots resulted. The Cape and Skinless barleys were badly affected with leaf blotch.

The yields per acre were as follows:—

	t.	c.	q.
Sunrise oats	10	11	2
Lachlan oats	8	10	1
Gresley wheat	8	1	3
Cape barley	6	1	1
Skinless barley	3	16	2
Slav rye	5	9	0

From the results obtained it appears that an early maturing variety of oats is the most suitable crop to grow either for feeding-off purposes or for silage. The results confirm those obtained during 1925, when 1 acre each of Sunrise and Mulga oats carried 100 sheep for 129 and 102 days respectively.

Farmers' Experiment Plots.

WHEAT AND OAT EXPERIMENTS, 1926.

Central Western District.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

THE system of field experiments in co-operation with farmers on their own land, which has been a special activity of the Department of Agriculture for the last twenty years, was never more popular than at present. This can be regarded as evidence of their value to the farming community, and there is no doubt they have been greatly used by farmers as a guide in farming operations and in elucidating many problems. Particularly have they demonstrated the comparative value of varieties from the view-point of yield, drought and disease resistance, &c., and the necessity of employing pure and graded seed, the right quantity of seed and superphosphate per acre in each locality, the best methods of cultivation, treatment for disease, &c., &c. As evidence of their increase in popularity it might be stated that in the Central West the number of centres where experiments are being conducted has risen from eleven to forty-eight in the last four years, the number of plots from 169 to 400, and the area under experiments from 147 acres to 423 acres.

In the season just past the following farmers conducted wheat and oat experiments in co-operation with the Department in this district :—

Wheat Experiments.—

C. A. Carter, "Kikiamah," Grenfell.
H. Nealon, "Currajong," Quandong.
R. B. Black, "Braemar," Greenethorpe.
A. McKay, Greenethorpe.
H. H. Taylor, "Ravensleigh," Eualdrie, via Grenfell.
A. Rowlands, "The Pines," Neville, via Blayney.
Robinson Bros., Tallawang, via Gulgong.
B. J. Townsend, "Glenarvy," Eugowra.
H. Pengelly, Eugowra.
Y. H. Walker "Yamboola," Eugowra.
J. T. Noble, "Sunnyside," Eugowra.
D. O'Neil, "Clear View," Bowan Park.
E. E. Herbert, Eugowra.
A. F. Waugh, "Rosewood," Grenfell.
J. W. Caldwell, "Matruh," Borenore.
Chas. Pengelly, "Springthorpe," Eugowra.
E. L. McLaren, "Locksley," Nora Creek, via Cumnock.
Wm. Burns, "Goongirwarrie," Carcoar.

Oat Experiments.—

H. C. Toole, "Helston," Tarana.
J. T. Cantrill, "Hazeldean," Borenore.
C. A. Carter, "Kikiamah," Grenfell.
H. Nealon, "Currajong," Quandong.
Y. H. Walker, "Yamboola," Eugowra.
Wm. Burns, "Goongirwarrie," Carcoar.

Pure Seed Wheat Areas.—

Quandong Agricultural Bureau :—

J. T. Hawick, Quandong, via Grenfell
J. Grahame, Quandong, via Grenfell.
S. Starr, "Waree," Cowra-road, Grenfell.
A. Nealon, Wiraga, via Grenfell.

Greenethorpe Agricultural Bureau.—

H. V. Gray, "Martindale," Greenethorpe.
N. Freebairn, Greenethorpe.
G. Fisher, "Spring Vale," Greenethorpe.

Eugowra Argicultural Bureau.—

N. G. McMillan, "Marara," Eugowra.
R. H. Herbert, "Glenwood," Eugowra.
F. Mulligan, "Woodlands," Eugowra.

The Season.

The season was rather erratic, the commencement of the fallow period being very wet, and good rains continuing up to December. From then to mid-March very dry conditions prevailed, but the sowing period was one of the wettest ever recorded, and great difficulty was experienced in getting the crop in under good conditions. For the growing period, August and September were satisfactory, but October and the first fortnight of November (a most critical time in the development of grain) were practically rainless. As a consequence the grain did not have the plumpness of the previous season, and yields did not quite come up to expectations. Some very hot days and strong drying winds also contributed towards bringing the crop in early, causing a considerable amount of shelling out, and producing a fair percentage of pinched grain

The following were the rainfall registrations at representative centres :—

RAINFALL.

Place	Fallowing Period, 1925-1926	Points	Growing Period, 1926.							Total Points.
			May	June	July.	Aug	Sept	Oct	Nov	
Grenfell	July to end April	18 89	207	182	176	83	111	156	Nil	8 65
Greenethorpe	July ,, ,,	20 50	230	249	20[illegible]	117	157	92	Nil	10·45
Eugowra	July ,, ,,	17 57	298	232	11[illegible]	114	128	57	Nil	9 39
Bowan Park	February, 1925, to April, 1926	34 44	388	167	237	215	220	97	36	13 14
Tallawang	October, ,, ,, ,,	[illegible] 66	40[illegible]	98	12[illegible]	6[illegible]	[illegible]82	95	10	11 80
Neville	August, ,, ,, ,,	27 10	499	125	285	384	468	211	103	20 75
Carcoar	November, ,, ,, ,,	15·09	436	121	324	268	386	214	88	18·32
Borenore	September, ,, ,, ,,	23 01	394	101	220	211	174	101	47	12 57
Tarana	November, ,, ,, ,,	20 63	454	64	291	230	194	152	80	14 15

Diseases.

The season was one of moderate disease attack, foot-rot and take-all being the most prominent. This was perhaps largely due to wet conditions at seeding time and in the early stages of growth. There would appear also to be some correlation between checking of t' 'nts, due to hard feeding-off of the growing crop, and take-all attack

Flying smut was not nearly so conspicuous this season as in the last four or five, possibly due to a short flowering period, the result of prevailing climatic conditions the previous season.

Flag smut was mild in its attack, except in isolated places. Moist conditions prior to the sowing period resulting in pre-germination of spores were, no doubt, responsible for the mild attack. Federation and varieties with Federation as one of their parents, appeared to have the highest degree of infection. Wandilla and Nabawa were outstanding in apparent resistance to this disease.

Rust made its appearance on the leaves, but did not develop sufficiently to affect the yield. It is probable that the change to dry weather conditions prevented a generalised attack.

The septoria fungus was present, particularly in plots of Binya, but did not reduce the yields.

The Crop of Waratah that yielded 33¼ bus.
Mr. C. A. Carter's farm, "Kiklamah," Grenfell.

Cultural Details in Wheat Variety Trials.

C. A. Carter, Grenfell.—Dark red basaltic loam soil; fallowed August, springtoothed three times; harrowed three times; sown 14th and 15th May; seed, 50 lb.; superphosphate, 50 lb. high-grade; rain on fallow 10·20 inches, on crop 8·25 points; dry weather at finish did not allow crop to yield up to expectations, but nevertheless it was very satisfactory.

H. Nealon, Quandong.—Red loam soil; fallowed July, springtoothed end September and December, and harrowed November; ground flooded and washed at end of March and again in April; great difficulty in preparing

ground, owing to incessant rains; finally reploughed and harrowed before sowing on 27th and 28th May, and harrowed after. Week after sowing whole area flooded again; germination not even, but good under the circumstances. Yields light, but satisfactory in view of the adverse conditions.

R. B. Black, Greenethorpe.—Red basaltic loam soil; undulating; fallowed June, harrowed twice, and after sowing springtoothed six times, and disced in January; sown 21st–26th May; seed 52 lb., superphosphate 65 lb. high-grade. Rainfall on growing crop, 7·82 inches; very even in growth, and yields very satisfactory.

A. McKay, Greenethorpe.—Black loam soil, level; fallowed June, disced twice; rigid-tined once; springtoothed twice, and combine sown 27th May; seed 60 lb., superphosphate 90 lb. of standard grade; soil too wet at sowing time, and germination patchy; yields reduced owing to unevenness and weed growth.

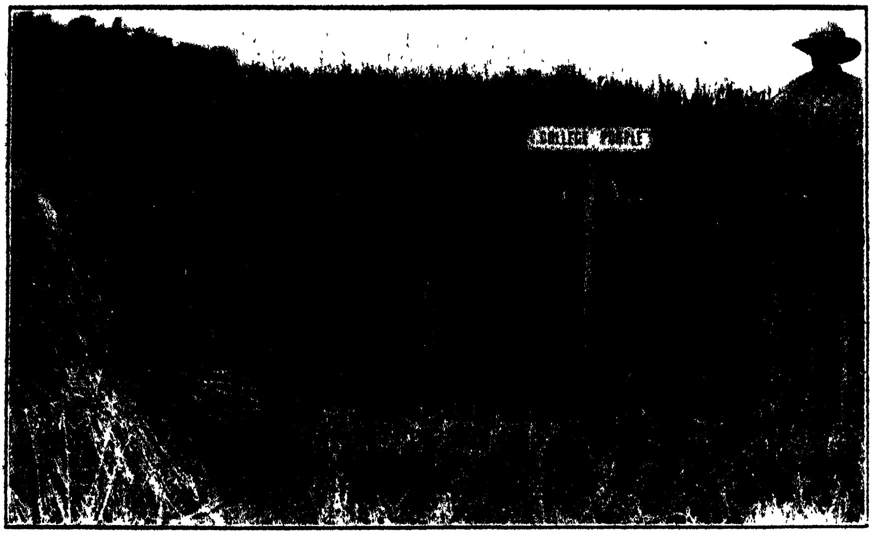
Bena Wheat at Mr. J. Grahame's Quandong, via Grenfell.
Yields—No manure, 21 bus. 40 lb.; 60 lb. superphosphate, 27 bus. 10 lb.

H. H. Taylor, Eualdrie.—Level, red loam soil; fallowed end August, harrowed twice; disced January; skim-ploughed May; sown with tractor and drill 19th May; superphosphate, 60 lb.; seed, 52 lb. Rainfall on fallow, 15·16 inches; on growing crop, 7·65 inches; hot winds and delayed stripping caused shelling out, which was excessive in Gresley, fairly bad in Waratah and Canberra, and least of all in Union, Ranee, and Penny.

B. J. Townsend, Eugowra.—Red basaltic, slightly sandy, loam soil; fallowed August; springtoothed four times; sown 5th–6th May; seed, 60 lb.; superphosphate, high-grade, 60 lb.; heavy rain after sowing affected germination slightly and scoured the soil.

A. Rowlands, Neville.—Red loam soil, sloping; locality has an altitude of 2,800 feet; fallowed October; disced twice, skim-ploughed before sowing, too wet to cultivate; sowing delayed owing to incessant rain; sown 7th June; seed, 60 lb.; superphosphate, 60 lb. Germination and stooling very good; winter months cold and wet; October and November rains better than further west, and yield very satisfactory; harvested first and second weeks in January.

D. O'Neil, Bowan Park.—Chocolate-red loam soil, sloping; previous crop, oats; land cropped to wheat, oats, and maize since 1872; first ploughed in February, reploughed October, springtoothed February, skim-ploughed mid-March, springtoothed April, May, and prior to sowing. Sown, 8th–10th June; seed, 60 lb.; superphosphate, 60 lb.; soil very moist at sowing, but germination and growth very good. Crop suffered from excess of winter rains.



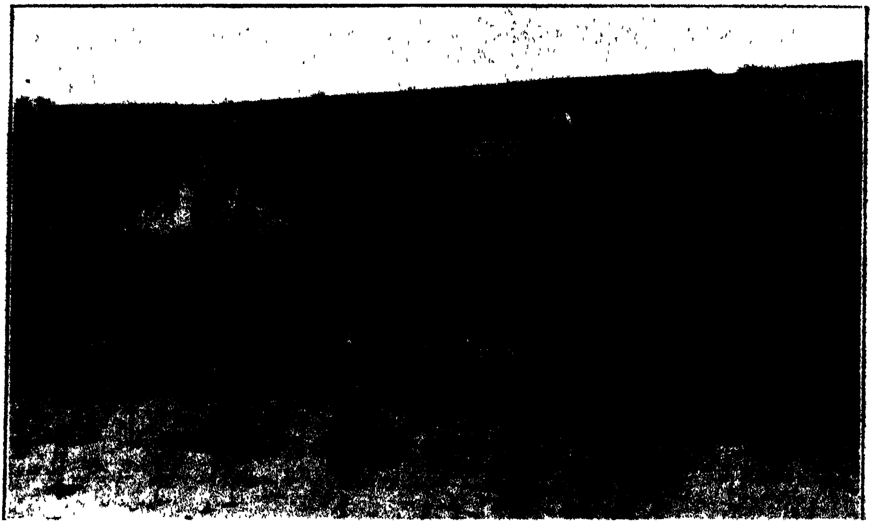
College Purple Straw, Mr. B. J. Townsend's "Glenarvy," Eugowra.
Yield, 24½ bus.

Chas. Pengilly, Eugowra.—Heavy red loam soil, level; cleared 1924; fallowed August, 1925; harrowed twice; scarified three times. Sown 5th June with 64 lb. seed and 60 lb. superphosphate. Fallow received very heavy rain, and conditions during sowing period were not good; crop did not germinate or stool well, and yields light in consequence.

Y. H. Walker, Eugowra.—Light red loam soil, sloping; fallowed mid-July; harrowed twice, disced January, springtoothed twice, and combine sown (Wandilla on 29th April, and early maturing varieties on 26th May); seed, 52 lb.; superphosphate, 65 lb.; germination and growth very satisfactory.

A. F. Waugh, Grenfell.—Light red loam, level; fallowed August, spring-toothed twice, disced and harrowed once; sown 28th May; seed, 60 lb.; superphosphate 60 lb.; rainfall excessive immediately after sowing; germination and stooling fair, growth very good.

J. W. Caldwell, Borenore.—Chocolate-red to grey loam, sloping, across plots; fallowed October; harrowed twice; reploughed, harrowed prior to sowing and harrowed after; sown, 19th June; seed, 68 lb.; superphosphate, 90 lb.; winter rains heavy; germination good, but stooling not dense. Locality has an altitude of 2,700 feet, and harvesting eventuated on 4th and 5th January.



This crop of Turvey ran 30 bus. per acre.
Owner, Mr. R. B. Black, "Braemar," Greenethorpe.

Wm. Burns, Carcoar.—Light red loam soil, sloping; fallowed November after winter fodder crop; harrowed and springtoothed twice; sown 19th June (very much delayed through incessant rain); superphosphate, 60 lb., seed 60 lb. Winter very cold, and heavy rain caused soil to set, preventing stooling.

Robinson Bros., Tallawang.—Light red loam soil, level; previous crop, winter fodders of oats and barley in a definite two-course rotation, which has given excellent results. Fallowed 1st October; springtoothed end of November, and twice between mid-March rain and prior to sowing; seed, 56 lb.; superphosphate 60 lb.. Sown 10th May. Best season as regards rain experienced for some years in this district; germination and growth very good; straw short.

Results of Wheat Variety Trials.

Variety.	C. A. Carter, Grenfell.	H. Nealon, Quandong	H. H. Taylor, Bualdrie.	R. B. Black, Greenethorpe.	A. McKay, Greenethorpe.	A. Waugh, Grenfell.	B. J. Townsend Eugowra.	A. Rowlands, Neville.	Chas. Pengelly, Eugowra.	Y. H. Walker, Eugowra.	Robinson Bros., Tallawang	D. O'Neil, Bowan Park.	J. W. Caldwell, Borenore.	Wm. Burns. Carcoar.	District Average.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Bena	30 25	22 56	18 0	28 2	19 18	21 25	29 20	34 46	18 19	...	24 10	26 45	22 12	15 15	23 57
Waratah ...	33 32	20 26	18 48	...	...	...	...	33 47	17 16	27 30	22 48	23 0	24 10	15 5	23 38
Gresley	...	19 36	14 44	...	16 27	19 29	...	20 44	12 0	...	...	20 42	20 15	12 0	17 20
Union ...	30 45	19 50	19 47	..	21 57	...	29 10	...	...	...	22 48	27 11	...	...	25 18
Canberra ...	...	18 54	19 26	...	...	24 26	...	...	16 23	26 20	17 20	23 14	...	...	20 52
Wandilla ...	27 10	21 34	...	26 22	...	...	29 10	...	...	24 10	...	30 30	...	...	26 29
Yandilla King ...	27 5	...	...	27 33	...	...	27 49	20 10	...	...	...	30 45	...	13 20	24 25
Marshall's No. 3	28 40	19 30	...	25 0	...	...	...	28 20	...	...	...	...	...	...	25 23
Binya	24 5	20 12	...	...	21 7	...	...	...	...	...	22 8	...	...	...	21 53
Turvey	...	22 37	...	30 8	...	...	30 43	...	...	...	...	...	...	...	27 50
College Purple Straw	...	...	...	26 5	...	...	24 27	26 30	...	...	...	...	...	...	25 16
Penny ...	...	23 45	18 0	...	...	...	...	...	...	...	...	...	...	...	20 53
Canimbla ...	...	...	...	...	...	...	...	...	...	...	...	...	19 8	13 0	16 4
Cleveland ...	...	...	...	...	...	...	...	27 24	...	...	...	...	...	15 30	21 27
Clarendon ...	27 43	...	...	...	...	...	...	...	12 30	...	...	...	...	...	20 7
Barootа Wonder	...	...	...	27 10	...	...	...	...	...	...	...	...	...	...	27 10
Nabawa ...	...	...	...	...	...	...	...	...	18 36	...	...	...	...	...	18 36
Wannon ...	...	...	...	...	...	...	...	...	17 43	...	...	...	...	...	17 43
Rajah	...	...	...	...	...	...	...	...	...	...	...	...	25 10	...	25 10
Ranee	...	...	21 0	...	...	...	...	...	...	...	...	...	...	...	21 0
Aussie	...	...	...	...	23 0	...	...	...	...	...	...	...	...	...	23 0
Cadia	...	..	...	...	...	...	...	..	...	...	...	. .	24 0	...	24 0
Hard Federation	...	19 41	...	...	...	...	...	...	...	...	...	...	...	...	19 41
Barwang ...	...	...	...	...	...	...	...	...	...	...	18 0	...	...	...	18 0

Yields were not obtainable from Mr. G. L. McLaren, Nora Creek, via Cumnock, where it was impossible to sow on fallow owing to incessant rain and boggy nature of the ground.

Cultural Details in Oat Variety Trials.

C. A. Carter, Grenfell.—Same soil and preparation as for wheat variety trial; sown 13th May; seed 40 lb., superphosphate 50 lb.; even, dense crops; ripened too quickly owing to dry weather at finish, and shelled rather badly, particularly Belar. Fulghum gave highest yield, 37 bus. 10 lb. In 1925 it yielded 55 bus. 35 lb.—the best by a substantial margin.

H. Nealon, Quandong.—Same soil and preparation as for wheat varieties; sown 7th June; seed, 50 lb., superphosphate 56 lb. high-grade; germinated well and made very fair growth considering the flooding and excessively wet conditions which prevailed.

YIELDS of Oat Variety Trials.

Variety.	Grain Yields.						Hay Yields.											
	C. A. Carter. Grenfell.		H. Nealon. Quandong.		Y. H. Walker. Eugowra.		H. C. Toole, Tarana.				J. T. Cantrill. Borenore.				Wm. Burns, Carcoar.			
	bus.	lb.	bus.	lb.	bus.	lb.	t.	q.	c.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Fulghum	37	10	24	30	...		...				...				...			
Mulga	34	25	28	0	32	30	1	12	0	0		12	0	0	2	5	0	0
Lachlan	33	30	23	0	36	20	1	5	0	0		17	0	0	1	15	0	0
Belar	27	10	..		...		1	8	0	0		15	0	0	...			
Algerian	..		..				1	17	0	0	1	2	0	0	...			
Guyra	..				.		1	10	0	0	1	0	0	0	...			

Y. H. Walker, Eugowra.—Same soil and cultivation as for wheat variety trial. Sown, 26th May; seed 52 lb., superphosphate 60 lb.; germination and growth very fair.

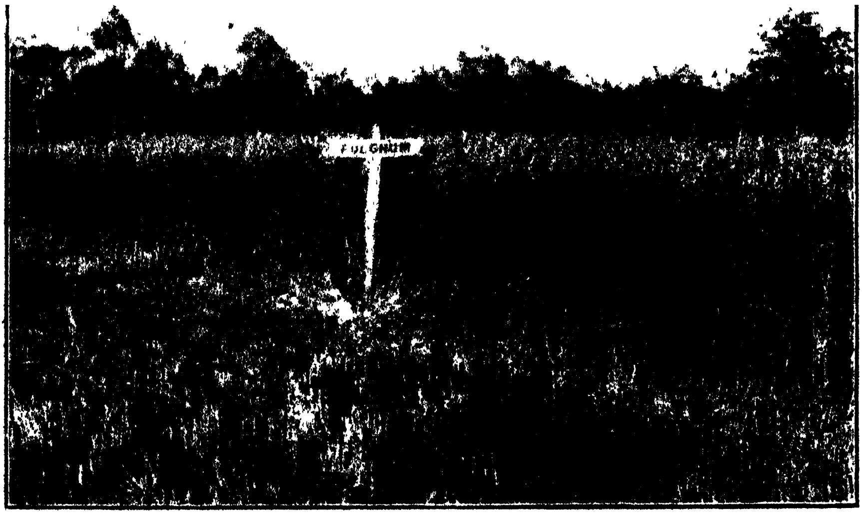
J. T. Cantrill, Borenore.—Soil red basaltic loam, sloping; fallowed September, harrowed twice, springtoothed twice, and skim-ploughed prior to sowing, followed by harrows; sown, 28th May; superphosphate 90 lb.; sowing delayed too long owing to inability to get on the ground; germination good, stooling poor.

H. C. Toole, Tarana.—Grey sandy loam in good condition at sowing time; fallowed from October; sown, 27th May; superphosphate, 85 lb.; seed, 50 lb.; rain on growing crop, 20·15 inches. Growth very good, not dense; Algerian gave best quality hay; Guyra and Mulga were considered best for feeding-off value.

Wm. Burns., Carcoar.—Oat varieties were sown as winter fodders, but owing to incessant rain ground too wet to feed off, and they were left for hay Soil grey loam; fallowed from previous November; harrowed, springtoothed; sown 29th March; seed, 40 lb.; superphosphate, 60 lb.; very good, dense crop.

Cultural Notes on the Pure Seed Wheat Areas.

The system of establishing pure seed wheat areas with members of the Agricultural Bureau has been inaugurated in the Central West. and will eventually do much good by raising the standard of seed throughout the district. Owing to the difficulty of keeping seed pure, and in view of the fact that the individual wheat-grower already has too many varieties on his farm, the system has been modified to permit of one variety only to each grower. The area sown is from 3 to 4 acres in each case, and experiments to determine the best quantity of seed and of superphosphate, cultivation, and seed treatment, &c., are made in conjunction with the pure seed area whenever possible.



A Crop of Oats that yielded 33½ bus.
Grower, Mr. H. Nealon, "Currajong," Quandong.

GREENETHORPE AGRICULTURAL BUREAU.

H. V. Gray, Greenethorpe.—Soil dark-red basaltic loam: undulating; fallowed July, rigid-tined four times, harrowed three times,; sown, 18th May; seed, 60 lb.; manurial trial from 60 lb. to 120 lb. superphosphate in four plots. Variety Bena was used; excellent crop, very dense.

N. Fairbairn, Greenethorpe.—Soil, red loam, sloping; fallowed August, and springtoothed and harrowed twice; sown, 28th May; seed, 60 lb.; variety, Gresley. Divided into manurial trial of 60 to 100 lb. superphosphate; growth very good. Plots unfortunately not harvested separately in error; appearances favoured heaviest application of superphosphate.

G. Fisher, Greenethorpe.—Waratah sown under excellent conditions for seed treatment trial; promising high yield, was destroyed by fire, together with large area of farm, within a week of stripping.

Quandong Agricultural Bureau.

J. T. Hawick, Grenfell.—Waratah on virgin ground; chocolate loam, level, sown, 21st June; 60 lb. seed; superphosphate, 70 lb.; fallowed from previous November, worked twice; ground flooded twice before sowing, and once after; poor germination, thin stooling.

J. Grahame, Quandong.—Bena on new land, well fallowed, and in good condition at sowing; red loam, high ground; sown, 27th May; seed, 60 lb.; sown in manurial trial of three blocks.

S. Starr, Grenfell.—Waratah and Federation varieties; soil, red loam, low-lying; fallowed from August, harrowed once, springtoothed four times; sown, Federation on 15th May, Waratah on 20th. Divided into quantity of seed and superphosphate trials, but not harvested separately owing to uneven germination as result of heavy rainstorm of 215 points following sowing. Waratah under water for some days.

A. Nealon, Wiraga.—Florence variety; red loam, low-lying; September fallowed in wet condition at sowing time; sown, 27th May; superphosphate, 56 lb.; seed, 60 lb. Germination satisfactory, but land flooded in June; soil set and stooling very bad; thin and uneven crop.

Eugowra Agricultural Bureau.

N. G. McMillan, Eugowra.—Bena variety; red to black loam soil; fallowed end September; springtoothed twice, disced once, and combine sown 12th June; superphosphate, 50 lb. Seeding trial with 45, 60 and 75 lb., the last giving highest yield.

R. H. Herbert, Eugowra.—Waratah on red basaltic loam, sloping; fallowed with sundercut in January; springtoothed in September, December, January (twice), February, April, and prior to sowing; sown 17th May; seed, 60 lb.; quantity of superphosphate trial, but heavy rain after sowing caused bad, uneven washaways across the plots, and yields did not afford fair comparison.

Yields of Pure Seed Wheat Areas.

	Eugowra Agricultural Bureau.			Quandong Agricultural Bureau.				Greenethorpe Agr. Bureau.	
	R. H. Herbert.	N. G. McMillan	F. Mulligan	J. Grahame	S. Starr.	J. T. Hawick.	A. Nealon.	H. V. Gray.	N. Freebairn
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Bena	...	19 53	...	24 17	...	...	...	36 9	...
Federation ...	...	...	30 0	...	25 0	...	...	...	...
Waratah	30 10	...	...	...	14 15	18 0	...	...	...
Gresley	...	...	...	...	...	...	...	...	27 0
Florence	...	...	...	...	...	...	13 30	...	...

F. Mulligan, Trajere.—Federation; dark-red loam, undulating; sown 6th–7th May; seed 75 lb.; superphosphate, 100 lb., high-grade; fallowed August, harrowed twice, and springtoothed five times. Excellent condition

at sowing; germination and growth very good. Too much rain was experienced in June and July, and considerable amount of disease, particularly flag smut, was present.

Manurial Experiments.

Experiments to determine the best quantity of superphosphate to apply were conducted with the following:—

H. Pengelly, Eugowra.
D. O'Neil, Clear View, Bowan Park.
J. T. Noble, "Sunnyside," Eugowra.
E. E. Herbert, Eugowra.
Robinson Bros., Tallawang.
H. V. Gray, Greenethorpe.
R. H. Herbert, "Glenwood," Eugowra.
J. Grahame, Quandong.
N. Freebairn, Greenethorpe.
S. Starr, "Waree," Grenfell.

The last five were conducted in conjunction with pure seed areas, and details have been given.

Messrs. E. E. Herbert, J. T. Noble, and H. Pengilly's trials were conducted under the auspices of the Eugowra Agricultural Bureau with superphosphate donated by two manure firms. Comparable yields were not obtainable from the first two.

H. Pengilly, Eugowra, used Waratah, and sowed on 10th June with 66 lb. seed on well-worked fallow.

Robinson Bros., Tallawang.—Same details as for wheat variety trials. Yield with Canberra, 84 lb., was nearly a bag better than with 56 lb. superphosphate.

YIELDS of Quantity of Superphosphate Trials.

	D. O'Neil, Bowan Park.	J. Grahame, Quandong.	H. V. Gray, Greenethorpe.	R. H. Herbert, Eugowra.	H. Pengelly, Eugowra.	Robinson Bros., Tallawang.
Variety.	Canberra.	Bena.	Bena.	Waratah.	Waratah.	Canberra.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Standard superphosphate—						
35 lb.	...	24 0	...	...	...	...
45 lb.	23 40	...	...	32 0	..	...
56 lb.	...	...	...	...	.	17 20
60 lb.	24 47	27 10	35 29	29 30	15 21	...
80 lb.	24 30	...	33 9	29 0	17 0	20 35
90 lb.	...	...	...	...	13 8	...
100 lb.	...	...	38 32	...	..	...
112 lb.	...	...	...	...	11 25	...
120 lb.	...	...	37 26	...	...	...
High-grade superphosphate						
35 lb.	23 5	...	...	...	...	...
45 lb.	24 0	...	...	...	...	...
No manure	21 20	21 40	...	...	...	..

D. O'Neil, Clear View, Bowan Park.—Same details as for wheat variety trials, sown with Canberra, with different quantities of standard and high-grade superphosphate. The highest yield was with 60 lb. standard superphosphate. This grade proving superior in last season's trial also.

Seeding Experiment.

N. G. McMillan, Eugowra.—Details of this trial were given under pure seed areas; and the yields were:—

			bus.	lb.
Bena...	...	75 lb seed per acre..	21	40
" ...	...	60 " "	19	36
"	...	45 " "	18	22

Sowing of this trial was delayed until 12th June, owing to unfavourable sowing conditions. The heaviest quantity of seed, particularly with a late to mid-season variety, like Bena, would be expected to give the most satisfactory stand and the highest yield.

Comments on Results.

Varieties.—The average yields of wheat varieties in experiments in the Central West are shown in the table of yields. This affords some indication of the behaviour of the varieties over an area extending from Grenfell north to Tallawang, approximately 240 miles, and Neville west to Eugowra, approximately 100 miles, with altitudes varying from nearly 3,000 feet to 890 feet. It is apparent that the newer varieties, particularly Bena and Waratah, are adapted to a wide range of conditions, the former yielding 34 bus. 46 lb. and 29 bus. 20 lb. respectively, at the two limits of altitude. The averages of the varieties giving the best yields in the typical wheat section of the district are:—Turvey, 27 bus. 50 lb.; Wandilla, 26 bus. 29 lb.: Bena, 26 bus. 12 lb.; Waratah, 25 bus. 42 lb.; Union, 25 bus. 18 lb.; Marshall's No. 3, 25 bus. 23 lb.; College Purple Straw, 25 bus. 16 lb.; Yandilla King, 24 bus. 18 lb. These averages give a good indication of the behaviour of these varieties during the season.

It is evident that the newer departmental varieties, Waratah, Bena, and Union, are destined to play a big part in increasing production—so superior to old favourites are they proving under a wide range of seasons, soils, and climates. In their competition with other varieties they have to reckon with importations from other States, and in this particular it appears from this season's trials they have possible rivals in Nabawa (a resister to flag smut), Rajah, and Wannon.

The most consistently poor variety this season has been Gresley, tried at nine centres, and nowhere reaching seven bags.

With regard to oats, Fulghum and Mulga have been the most consistent the last two seasons. The area under this crop is increasing considerably, and should eventually have a marked effect on the wheat yield by assisting in the control of disease.

Quantity of Superphosphate.—The experiments indicate that the tendency to increase considerably the amount of superphosphate to be applied is justified. This tendency has arisen chiefly from a knowledge of the large

quantities used in Victoria and South Australia, but experiments show that increases approaching their standards are far from economical. It would appear that 80 lb. on typical wheat soils would not be too much to apply.

Seed Treatment.—The wheat was treated with copper carbonate, and it is significant that in a season which might be considered favourable for the development of bunt, it was not present (even in a slight degree) in any of the plots. Universal adoption of the treatment is well justified.

General.—The foregoing experiments, together with those in previous years (recorded annually in the *Agricultural Gazette*) are recommended as a guide to future operations. Particularly is this so with regard to varieties, amount of seed and superphosphate to use, seed treatment, &c. The basis of it all, however, must be fallowed land, commenced early, worked at the right depth with the right implements, and more often than is usual.

Murrumbidgee Irrigation Areas.

E. B. FURBY, H.D.A., Agricultural Instructor.

THE following settlers co-operated with the Department in conducting field experiments with wheat during the 1926 season :—

J. Lyne, Farm 1636, Yenda.
J. Fuke, Farm 1622, Yenda.
J. McGann, Farm 126, Hanwood.
McDonald Bros., Farm 197, Hanwood.
C. A. Long, Farm 1689, Lake View.
C. Hayes Williams, Farm 1456, Yenda.

These trials were conducted on irrigable and non-irrigable lands, and although it will appear that the yields from the irrigable lands do not compare with those from the dry areas, it must be pointed out that the irrigationist was placed at a distinct disadvantage this season on account of the vagaries of the weather. The rainy period commenced much earlier than usual, upsetting the usual periods of irrigation in preparing the land for wheat.

The Season.

The rain recorded for the season was: March, 233 points; April, 323; May, 165; June, 127; July, 115; August, 187; September, 106; and October, 120. Total, 1,376 points.

The heavy rain in March, following upon artificial applications of water, together with further heavy rains in April, resulted generally in late plantings. In addition to this, however, the extent of the irrigation farms is such that fallowing cannot be practised to its fullest extent, or to its greatest advantage, and land is cropped continuously for more years than is generally practised

For those settlers who had their land prepared well in advance, the season was a fairly good one, except in the spring, when the rain tailed off to light showers of little consequence and benefit. Most crops suffered slightly on account of this.

Absence of Disease.

The absence of disease in the crops this year was very pronounced. All the seed used in the experiments was dry pickled, and with beneficial results, as bunt was not seen in any crop. Both take-all and flag-smut could be found, but not in sufficient quantities to cause any depreciation of crop.

Details of the Plots.

Farm 1636.—A variety trial for grain was conducted on this plot. Sown 17th April on fallowed land which had only grown one other crop of wheat. Soil, a light to medium red loam, of fair depth; mouldboard ploughed during December, 1925, and worked twice with a disc cultivator; in ideal condition for sowing, and entirely free from weeds. Seed sown at rate of 50 lb. per acre, and high-grade superphosphate, 45 lb. per acre.

For the second year, Bena came out on top, and, in addition, gave very fine results in the field. It is a variety worthy of consideration by settlers for main sowings on similar soils. Although Clarendon did not give such a high yield, it had one outstanding feature. At one period, when it appeared as if the crops would be a failure, Clarendon, being an early variety, would have cut from 1 ton to 25 cwt. of hay, for which purpose it is very suitable, and could be used for sowing around headlands.

Farm 1622.—In the variety trial for grain, plots were sown on irrigable red loamy soil which had been cropped for five years in succession, the previous crop being oats. Land stocked with sheep during summer: mouldboard ploughed in March after rain; harrowed twice; drilled in during second week in April, and harrowed again. Seed at 60 lb. and superphosphate at 56 lb. per acre were used. One irrigation was given in the spring just as the heads were appearing, except in the case of Binya, which was well out in head when watered.

Of the varieties under trial, Major is to be preferred under irrigation conditions. It is later maturing than the others, and responds better to watering, and having good strong straw is not so likely to lodge. Binya, though giving a fair yield, has a very short straw, and cannot be considered suitable for these lands. Union is a mid-season variety which showed promise of giving better yields under more favourable conditions.

A rate of seeding trial was also conducted on this farm with Waratah on dry area. The results were as follows:—

Seed 40 lb. per acre	18 bus. yield.
,, 50 lb. ,, ...	21 ,,
,, 55 lb. ,, ...	21 ,,
,, 60 lb. ,, ...	24 ,,
,, 65 lb. ,, ...	24 ,,

These plots were sown on stubble land, worked in a similar manner to the previous plot, though it was not in ideal condition, being worked too deeply,

and containing mush straw. The seed was sown during the middle of April, and from the results obtained it can be seen that no advantage is gained by departing from the standard rate of 60 lb. seed per acre on this class of light land. Some interesting results have been obtained in this locality on irrigated land by seeding at the rate of 90 lb. per acre, indicating that the standard rate may yet be raised with considerable benefit.

Farm 197.—Land had not been cropped for two years, but was grazed in the meantime. Soil was medium to heavy red loam about 7 inches deep, and irrigable; disc ploughed in April; disc cultivated in May, and harrowed just previous to sowing on 21st May. This land, being flat and having been watered in March, its thorough preparation was hampered by the continuous autumn rains, and consequently the results are not a true reflection of the productivity of this class of soil. In the wheat variety trial the seed was sown at 60 lb. per acre, together with superphosphate at 70 lb. per acre.

Minister variety was grown on this farm, but not included in the trial. The yield from this crop, sown under the same conditions as the trial, was 9 bags per acre. This is a mid-season variety which stands up well to watering, and is a safe variety to grow here, under irrigation, for grain. Waratah has, over a period of years, demonstrated its suitability for grain under irrigation. Aussie though yielding well, is a short and weak-strawed variety, not eminently suitable for irrigation purposes, both Gresley and Firbank being preferred for late sowing.

In the rate of seeding trial, the variety used was Gresley, and, as with the trial on the dry area, no benefit accrued from departing from the standard sowing of 60 lb. per acre.

During the spring watering of these plots, difficulty was experienced in getting an even distribution over the manurial trial, resulting in irregularities of growth, and upsetting the accuracy of the yields, which were as follows:—

Seed 90 lb. per acre	14 bus.
„ 75 lb. „	14 „
„ 60 lb. „	14 „
„ 45 lb. „	13 „
„ 30 lb. „	11 „

Farm 1589.—It was intended that this trial be cut for hay, but owing to poor growth and a better promise of a crop of grain, it was stripped.

The plots were on irrigable land, though only one irrigation and that in the spring, was given. This was patchy, resulting in an unevenness both in the variety and manurial plots. The soil, which is a medium to heavy red loam, was ploughed in January, and only cultivated once with the disc a month before sowing. Seed at 60 lb. and superphosphate 70 lb. per acre were sown with the combine on the 7th May. Weather was favourable to a good germination, but the crop did not grow well, or do justice to these well-known varieties, any one of which can be safely grown on all classes of soil under irrigation.

VARIETY Trials for Grain.

Variety.	Farm 1636.	Farm 1622.	Farm 197.	Farm 1589.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Aussie	......	......	17 0	......
Bena	33 7	......	......	......
Binya	......	18 0	14 0	......
Clarendon	20 57	......	......	......
Federation	20 48	......	......	......
Firbank	......	......	13 0	......
Gresley	28 21	......	14 0	......
Major	......	25 0	......	9 16
Marshall's No. 3	......	......	......	16 50
Penny	......	12 0	......	......
Union	......	15 0	......	......
Wandilla	......	......	......	13 18
Waratah	30 30	......	17 0	......
Yandilla King	......	......	......	13 16

It would appear, from the manurial trial, that heavy sowing of superphosphate has no immediate benefit. Owing to the irregularities of the watering, the results from this trial cannot be accepted as demonstrating any definite feature with regard to manuring.

MANURIAL Trial for Grain.

Manure.	Farm 1589. bus. lb.
No manure	16 4
56 lb. superphosphate per acre	18 15
84 lb. „ „	16 50
112 lb. „ „	12 15
140 lb. „ „	15 40

Farm 126.—Varieties for hay were tried on this plot. The soil is typical of a large portion of the area, which has been under cultivation for many years. It consists of fairly heavy red loam, from 5 to 8 inches deep, and had not been cropped for two years. It was ploughed two years ago and left till August, 1925, when it was ploughed again and left till the 17th May, 1926, and then disc cultivated and harrowed. The seed was sown on the 19th May at 60 lb. per acre and superphosphate at 90 lb. per acre.

Two of the varieties under trial, Barwang and Binya, were unknown on the area. Barwang showed promise of being a suitable variety for local conditions. It is a late maturing variety that stools well. Binya is an early variety, but a poor stooler, and cannot yet be recommended for growing, though the yield here was very good.

This trial was not irrigated in the spring, though water broke away and flooded a portion of Waratah, causing that portion to lodge so badly that it was lost at harvest.

Farm 1456.—The land on which the variety and manurial trials for hay were carried out had been cropped continuously for five years, the last crop grown being a 10½-bag crop of wheat. The soil is a medium heavy

loam of good depth; it was springtoothed in March to facilitate watering, which was carried out on the 15th of same month. On account of the rain no further cultivations were possible till 11th June, when the sundercut and springtooth cultivators were used. The crop was sown on the 20th June under anything but favourable circumstances. Being late-maturing varieties, the rate of sowing was increased to 74 lb. per acre, 84 lb. of superphosphate being used.

TRIALS with Wheat for Hay.

Variety.	Farm 126.				Farm 1456.			
	t.	c.	q.	lb.	t.	c.	q.	lb.
Barwang	2	13	0	4	....			
Binya	2	12	0	8	....			
Waratah	2	7	3	10	....			
Gresley	2	7	2	10	1	1	1	7
Wandilla	2	7	1	8	1	3	2	20
Firbank	1	19	0	12	....			
Yandilla King	....				1	3	0	20
Major	....				1	8	2	8

In the manurial trial it was intended to use Marshall's No. 3, but in view of the lateness of planting, Gresley was substituted, giving the following yields :—

MANURIAL Trial for Hay.

Manure.	Farm 1456.			
	t.	c.	qr.	lb.
No manure	0	16	1	10
56 lb. superphosphate per acre	0	17	3	18
84 lb. „ „	1	1	1	7
112 lb. „ „	0	18	0	0
140 lb. „ „	1	2	2	22

One watering was given these plots in October, causing rust to appear in every variety. From the performance of Wandilla on this occasion, and in view of previous years' results, this variety can be classed as very suitable for hay purposes on the irrigation areas.

Summary.

These trials, sown under conditions likely to be experienced by any settler, indicate, together with previous experience, several points, which, followed out, will ensure a fair degree of success. The season was said to be exceptional, because of the early rains, but is likely to happen again any time. The following salient points may be enumerated :—

That fallowing is essential, not so much to conserve moisture, but to sweeten the soil and to permit of early preparation of the seed-bed.

That when the land is prepared early in the year, there is less risk of being caught by early rains, and sowing operations can be carried out to time.

That early planting is also essential, even though late sowing will occasionally produce a good crop. But that is the exception. From early April till the middle of May is the period considered most suitable.

That for the most part, mid-season to late maturing varieties prove to be the most satisfactory to grow under irrigation, and should consequently be planted early.

Tubercle-free Herds.

Of the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner.	Address.	Breed.	Number tested.	Expiry date of this certification.
Department of Education ..	Yanco Agricultural High School.	......	26	12 Jan., 1928.
Walter Burke	Bellefaire Stud Farm, Appin.	Jersey..	36	19 March, 1927.
Department of Education ...	Gosford Farm Homes	......	32	16 April, 1927.
H. W. Burton Bradley ...	Sherwood Farm, Moorland.	Jersey..	71	21 May, 1927.
William Thompson Masonic Schools.	Baulkham Hills ...	......	33	15 June, 1927.
Department of Education ...	Mittagong Farm Homes.	......	33	7 July, 1927.
Hygienic Dairy Company ...	Glenfield Farm, Casula, Liverpool.	......	113	15 Sept., 1927.
Lunacy Department ...	Morisset Mental Hospital.	......	14	18 Oct., 1927.
Department of Education ...	May Villa Homes ...	......	6	3 Nov., 1927.
Do do ...	Eastwood Home ...	......	10	3 Nov., 1927.
Do do ...	Hurlstone Agricultural High School.	......	47	4 Nov., 1927.
Lunacy Department ...	Rydalmere Mental Hospital.	......	61	23 Nov., 1927.
A. E. Collins	Hazelhurst Dairy, Bowral.	......	10	6 Dec., 1927.
Miss Brennan	Arrankamp, Bowral	......	27	7 Dec., 1927.
Lunacy Department ...	Callan Park Mental Hospital.	......	26	15 Dec., 1927.
Chaffey Bros.	"Lilydale," Glen Innes.	......	15	25 Jan., 1928.
Lunacy Department ...	Kenmore Mental Hospital.	......	99	1 Feb., 1928.
Walaroi College	Orange	......	2	3 Feb., 1928.
Lunacy Department ...	Orange Mental Hospital.	......	3	7 Feb., 1928.

—Max Henry, Chief Veterinary Surgeon.

Field Experiments with Wheat.

Variety Trials at Cowra Experiment Farm.

J. A. O'REILLY, H.D.A., Experimentalist.

Wheat trials for hay and grain were continued during the past season. The object of these trials is to determine the most suitable varieties for this particular locality, and to test out new and imported varieties against those which are suited to this district. Pure seed areas of these varieties are grown each year, and the seed is made available for sowing in farmers' experiments. In this way they are tried under various soil and climatic conditions.

The trials were sown in three sections, viz.—(*a*) Early sown hay, (*b*) early sown grain, (*c*) late sown grain. Sowing was made in triplicate in order to obtain uniform results.

Fallowing was commenced on 7th July, 1925, the mouldboard plough being used. The fallow was stocked till the end of December, 1925, when it was disced; the land was springtoothed on 13th January, 1926. Following the rains in March, 1926, weed growth was very rapid, which necessitated the use of the sundercut on 26th April, followed by a springtoothing on 30th April. The site was harrowed prior to planting. These details apply for the early-sown hay and grain sections. For the later sowings the land received a further springtoothing and harrowing a few days prior to sowing.

The rainfall during the fallowing period was as follows:—July (1925), 60 points; August, 131; September, 74; October, 185; November, 431; December, 141; January (1926), 58; February, 37; March, 702; April, 338; total, 2,157 points.

Rainfall for the growing period is shown in the following table:—

Month.	Early Sowing.		Late Sowing.
	Grain.	Hay.	Grain.
	Points.	Points.	Points.
May	254	254	......
June	193	193	167
July	190	190	190
August	167	167	167
September...	230	230	230
October	99	99	99
November	51	31	51
Totals ...	1,184	1,164	904

The Season.

Taking it generally the season was an unusual one. After two dry summer months, the precipitation during March, April, and May was excessive, and rendered the complete eradication of weeds impossible. On this

account the germination of the varieties was retarded, and the weeds grew unchecked. Six weeks after planting the plots had made good headway, and were holding their own with the weeds. The drier spring months altered the prospects, and rain was badly needed. A good fall was registered early in September, and one was inclined to take an optimistic view of the situation, but the absence of rain and a succession of hot, drying days in November and December speeded up the harvest and limited the yield of the varieties. Disease was prevalent during the season, foot-rot especially diminishing the yields in all cases. Boisterous weather, which caused some of the varieties to shell, was experienced as they were ready to strip.

The Early-sown Grain Section.

These plots were sown on 6th May, 1926, at the rate of 42 lb. graded seed and 60 lb. superphosphate per acre. All seed was treated with a proprietary bunt preventive. Exquisite and Guinea were included in this trial for the first time, and behaved very satisfactorily. Harvesting took place on 11th December.

Variety.	Average Yields of Triplicate Plots, 1926.	Average since 1922.
	bus. lb.	bus. lb.
Exquisite	33 3	33 3*
Guinea	31 51	31 51*
Onas	29 52	39 3‡
Wandilla	28 41	39 42‡
Bredbo	27 29	34 19†
Yandilla King	26 18	26 18*
Bena	25 30	42 23‡
Hard Federation	24 19	33 17‡
Ford	21 56	34 44†
Canimbla	21 56	39 27‡
Cadia	17 51	33 26‡

* 1 year. † 2 years. ‡ 5 years.

Seed is unavailable of the varieties Exquisite, Guinea, Onas, Bredbo, and Ford.

The Early-sown Hay Section.

The plots were sown on 5th May, 1926, at the rate of 42 lb. of seed and 60 lb. superphosphate per acre. Exquisite and Yandilla King were the most outstanding varieties in this trial. The firstmentioned variety appears to be very suitable for hay purposes. Harvesting took place on 5th November, 1926.

Variety.	Average Yields of Triplicate Plots, 1926.	Average since 1922.
	t. c. q.	t. c. q.
Exquisite	3 5 1	3 5 1*
Yandilla King	3 2 2	3 9 3†
Canimbla	2 16 3	4 0 1‡
Waratah	2 15 0	4 3 0‡
Ford	2 13 0	2 13 0*
Yandilla	2 9 3	3 12 2‡

* 1 year. † 3 years. ‡ 5 years.

The Late-sown Grain Section.

The trial was sown on 11th June, 1926, at the rate of 58 lb. seed and 60 lb. superphosphate per acre. Duri and Bobin yielded well and are in many respects superior to Canberra. The trial was harvested on 11th December.

Variety.	Average Yields of Triplicate Plots, 1926.	Average since 1922.
	bus. lb.	bus. lb.
Duri	26 9	34 56‡
Bobin	22 14	26 45†
Bena	19 56	35 16§
Ford	19 48	23 9†
Waratah	18 26	36 4§
Boonoo	18 18	33 29‡
Hard Federation	18 8	33 9§
Canberra	18 1	18 1*
Nabawa	16 55	16 55*
Boolaroo	15 42	22 37†

* 1 year. † 2 years. ‡ 4 years. § 5 years.

Notes on the Varieties.

Hard Federation (Selection from Federation).—This variety is used as a check in both the early and late sown sections. It is a few days earlier than Federation, and over a number of years has yielded well.

Wandilla (Federation x Yandilla King).—Wandilla is shorter in the straw than Yandilla King, shows a good deal of resistance to flag smut, and holds its grain well. In trials over a number of years it has proved itself a reliable variety.

Yandilla King (Yandilla x Silver King).—A consistently good yielder for hay and grain. It holds its grain well, and is suitable for early planting in this district.

Canimbla.—A departmental production derived from a cross between Hard Federation and Cleveland. It is a fairly late variety, and a heavy yielder of hay and grain. The past season was not a suitable one for it. It does not shake very readily.

Waratah.—This is another departmental production from Purple Straw and Gluyas Early. It is a reliable yielder, and has gained a reputation for itself throughout the wheat belt of New South Wales. It suffered slightly from the wind storms in November and December.

Bena.—Is a natural cross between Hard Federation and Marshall's No. 3 developed at Cowra Experiment Farm. It is more resistant to disease than Hard Federation, and it a heavy yielder of grain. It does not shake very readily.

Cadia.—A variety about the same maturity as Canimbla, both having a common parent in Cleveland. Cadia is a heavy yielder of hay and grain, but this year it suffered badly from rough weather at harvest time.

Onas (Tarragon x Federation).—A South Australian production, similar in appearance to Federation, but later maturing. It holds its grain very well, and during the past five years has yielded very satisfactorily.

Bredbo.—A production from the same source as Bena. It is a promising variety, which holds its grain well. For the past two seasons it has yielded an average of over 30 bushels.

Boonoo (Steinwedel x Yandilla King x Zaff).—A promising early-maturing variety bred at Cowra Experiment Farm.

Boolaroo (Fr. Hard Federation x Clarendon).—An early-maturing variety which does not yield as heavily as Boonoo. It is a suitable variety for late sowing.

Bobin (Thew x Steinwedel).—One of our best early-maturing varieties.

Exquisite (Gluyas x Atlanta x Gluyas).—This variety was received from South Australia. Last season was its initial test in the variety trials. It behaved very satisfactorily, holding its grain, and promises to be a suitable dual-purpose wheat under our conditions.

Ford (Fan x Comeback x Tardent Blue x Zealand).—This variety was introduced from South Australia. It yielded very well in 1925, but last year it shelled badly. It is well worthy of further trial.

Guinea.—Is a supposed natural cross between Federation and Minister. It yielded well last year, and promises to be a good grain variety. It holds its grain very well.

Canberra (Federation x Volga barley).—An early-maturing grain variety. It is somewhat weak in the straw, and did not yield as well as Duri and Bobin.

Duri (Hurst's 14 x Canberra).—A suitable grain variety for late sowing in this district. For the past four years it has averaged over 30 bushels. It ripens with Canberra, and in many respects is superior to that variety.

Nabawa.—This is an early-maturing variety from Western Australia which appears to be resistant to flag smut. Its yield last year was not very encouraging.

NEW SOUTH WALES AND THE HUME WEIR.

MR. CATTANACH, Chairman of the Victorian Rivers and Water Supply Commission, suggested at the Albury Bureau Conference that New South Wales should not neglect to utilise to the full the benefits of the Hume weir. He said: "While the work itself is paid for in equal proportions by the Commonwealth, New South Wales, South Australia and Victoria, the main use of such a reservoir will be with New South Wales and Victoria. In regard to the regulation of flow, there will be a very large body of water made available for both New South Wales and Victoria, and Victoria has fairly well made up its mind where it will utilise its portion. It would be wise if some scheme were prepared on the New South Wales side, because the Hume Reservoir itself is too big and too important not to be put to its full and best use."

Prickly Pear.

Botanical Description, History, and the Problem the Plant Presents.*

G. P. DARNELL-SMITH, D.Sc., F.I.C., F.C.S., Biologist and Director of Botanic Gardens.*

In 1919 N. L. Britton and J. N. Rose published Vol. 1 of their work on *Cactaceæ*. In regard to types, they made a re-examination of type specimens and of all original descriptions. They found that the published geographical distribution of many species was faulty, and that conclusions based upon such data were unreliable. They found also that not only had specific names been transferred to plants to which they did not belong, but generic names were interchanged and the laws of priority ignored. Many valid species, too, had dropped out of collections and out of current literature, and had to be restored. It will be readily understood, therefore, that the path of the investigator among the Cacti is thorny in more senses than one. Work is rendered difficult from the fact that many plants require several years to mature; in some cases they take many years to flower in cultivation.

The name *Opuntia* is that of a town in Greece where some cactus-like plant is said to have grown.

The sections of the plant are known as joints or pads. The latter name is much to be preferred, otherwise one has at times to speak of the "joint of a joint." Some species have both round and flattened stems, hence stem structure can only be used in the most general way as a basis of classification.

Order, *Cactales*.

Perennial succulent plants, mostly very spiny. Leaves usually none, except in *Pereskia* and *Pereskiopsis*, when they are large but fleshy, and in *Opuntia* and its relations, when they are much reduced and mostly caducous. Spines vary in form, arrangement, size, and colour. The areoles are peculiar and complex organs, situated in the axils of leaves when leaves are present, and bearing the branches, flowers, spines, glochids, hairs or glands. Flowers usually perfect, solitary; lobes of the perianth often intergrading in shape and colour, sometimes sharply defined into sepals and petals; stamens numerous, filaments borne in the throat of the perianth. Fruit a berry.

Family, *Cactaceæ*.

Tribes.

Leaves broad, glochids wanting, flowers stalked.	1. *Pereskiae*.
Leaves terete, small or wanting. Areoles with glochids, flowers rotate (except *Nopaleae*)	2. *Opuntiae*.
Areoles without glochids, usually no leaves, flowers with definite tubes.	3. *Cereae*.

* Lecture on "Cactaceæ: Methods of Destroying Opuntias," delivered before the Sydney University Botanical Society, 22nd October, 1926.

Pereskia.—The genus *Pereskia,* the only representative of this tribe, is, on account of its similarity to other woody flowering plants, considered the nearest Cactus relative to other families, but this relationship is in all cases remote. Of the Cactus family, *Opuntia* is as near to it as any.

Opuntiæ.—This tribe contains seven genera and at least 250 species. The genus *Nopalea,* formerly classified with *Opuntia,* differs from it in having erect petals. It is of interest because *Nopalea cochenillifera* is the plant upon which the cochineal insect flourishes. The type locality is Jamaica; its original habitat is unknown. Cochineal was long supposed to be a vegetable product; its insect origin was not determined till 1703 by aid of the microscope. The cochineal industry is of prehistoric origin. The Spaniards found it well established when they conquered Mexico in 1518, and began at once to export the product. As early as 1523 Cortez was ordered to obtain and send to Spain as much as he could. From Mexico and Peru the industry was taken to Spain, India, Jamaica, the Canary Islands, and other places. The industry became very valuable. The insects were placed on the pads of the cactus plants, where they multiplied rapidly, and were brushed off and collected about three times a year. The plantations, sometimes containing 50,000 plants, were called nopalries. The cochineal colours, though brilliant and attractive, were not very permanent, and were discarded on the introduction of aniline dyes. It was with the idea of establishing a cochineal industry that the prickly-pear was introduced into Australia by the first fleet in 1788.

The *Opuntia* species grows naturally from Massachusetts to British Columbia, south to the Strait of Magellan. Several have become naturalised in the Old World and in Australia. Economically the species furnishes the Tuna fruit, largely imported into Eastern cities from Italy, and common in the markets of Mexico. Some species are used for hedges; some furnish an adjunct to forage for stock. Opuntias are known under a great variety of names—as prickly-pear in the United States, tuna in Mexico, and as sucker and bull-sucker in the Antilles.

The genus *Opuntia,* as understood by Rose and Britton, contains at least 250 species, but more than 900 names are to be found in literature. In the same species there may be variation in size, in colour of the spines, in their number, and in the colour of the flowers, according to the environment.

We are not alone in our troubles with prickly-pear. It has overrun some of the ranches in Texas, and has spread to an alarming extent in Cape Colony. The United States Department of Agriculture has made a number of investigations as to its value as fodder, but it has little fodder value. One report concludes: "It is a better substitute for water than for food, but with this statement of fact the best has been said concerning the forage possibilities of the plant"—a statement which is borne out by any analysis of green prickly-pear. It must be remembered that the damage caused by pear is not due only to the ground that it occupies, but that stock are thereby forced to eat the grass on the land unoccupied by pear more closely, and in consequence there is less chance of it seeding.

Governor Phillip introduced prickly-pear to Australia, having brought it from Rio de Janeiro with the First Fleet, to establish a cochineal industry. Since then different people have introduced a number of different species. At least ten species have escaped from cultivation in New South Wales.

The barbed glochidia are more to be feared than the spines. Areoles occur usually at the base of a leaf or fallen leaf; they are filled with glochids and woolly hairs; from them spring the spines, and at their base is a growing point, from which a flower bud or a new growing point may spring.

The value of the work of the systematic botanist, and the futility of those unacquainted with botany framing laws that deal with plants, is well demonstrated by the fact that by Act of Parliament in 1887 four prickly-pears were specially legislated against in New South Wales, viz.:—

1. *O. vulgaris.*
2. *O. brasiliensis.*
3. *O. monocantha.*
4. *O. tuna.*

Maiden's comment of these in 1911 was: "I have never seen *O. vulgaris* in Australia except as a poor plant in a botanic garden. I have only seen one plant of *O. brasiliensis* in Australia, and that in a botanic garden. *O. monocantha* is not rare, while *O. tuna* is a botanical will-o'-the-wisp." The work of Britton and Rose, published in 1919, has done much to clear up nomenclature.

Opuntias Wild in Australia.

There are a number of Opuntias in Australia that have escaped from cultivation. The chief are:—

1. *O. aurantiaca* (*O. ferox*, *O. horrida*, *O. dejecta*).—Occurs at Windsor, Scone, Queensland border. *Aurantiaca* refers to the colour of the flowers; with us they are usually not orange, but lemon colour. It is extremely brittle, the pads generally covered with long spines, which easily penetrate the skin and are transported on the legs of animals.

2. *Opuntia imbricata* ("Devil's Rope").—Found at Sofala, Murrurundi, and Scone. Native of Mexico. The fruit contains 3·48 per cent. of malic acid. This is a large percentage. Type locality unknown. The absence of types is probably due to the great difficulty in drying and therefore in preserving Opuntias.

3. *Opuntia nigricans* (*O. horrida*, *O. humilis*—this is the *O. tuna* of the New South Wales Act of 1887).—It is one of the most spiny prickly-pears. Flowers, orange to rose-pink. Found at Windsor and at Gungal. It is a native of Central and South America. It may have been introduced into Australia by the First Fleet. The tangle of early nomenclature renders it impossible to say what Opuntias were brought from Rio by Phillip in 1788, and those that were brought were probably obtained secretly. Spain would not part willingly with such a valuable asset as the cochineal industry. This plant, described and figured as *O. nigricans* by Maiden in the *Agricultural Gazette of New South Wales*, 1912, is given as *O. elatior* by Britton and Rose in *Cactaceæ*, 1919.

4. *Opuntia inermis.*—First taken to Scone by Dr. Carlisle in 1839 as a rare plant in a pot; from Scone a specimen was taken to Warwick. From these centres it spread, or was spread, and it is to-day *the* pest pear of Australia. It conserves water in vesicles which is thickened by mucilage. The pear was identified by Maiden as *O. inermis* D.C. in 1912, but there is some doubt about the correctness of the identification. Varieties of this species, sufficient to form the species of some botanist, are known in Australia, and this pear no doubt has varied considerably since its introduction.

The name *Cactus opuntia inermis* was originally given to a species of *Opuntia* which is figured poorly by A. P. De Candolle in 1799 (p. 138 of "Plantes Grasses"). Some plants, say 1 per cent., are very spinous but monospinous. Britton and Rose (*Cactaceæ*, 1919, page 161) put *Opuntia inermis* under *Opuntia stricta* Haworth, 1812, and give as synonyms:—*Cactus opuntia inermis* De C., 1799; *Cactus strictus* Haw., 1803; *Opuntia inermis* De C., 1828; *Opuntia airampo* Philippi, 1894; *Opuntia parva* Berger, 1912; *Opuntia ventonii* Griffiths, 1912; *Opuntia longiclada* Griffiths, 1916.

5. *Opuntia tomentosa* (Velvety Prickly-pear).—Common in Queensland, rare in New South Wales. Grows to 18 feet high. Prickles mostly wanting; pads covered with soft hairs. Flowers orange to red.

6. *Opuntia Ficus-indica* (Indian Fig or Barbary Fig), the principal prickly-pear yielding edible fruit. It is probably the largest of all Opuntias. Spines few, flowers yellow to orange. There are many forms (horticultural varieties), distinguished by the colour and flesh of the fruit. A decoction made by pouring hot water upon the pads of this or of *O. inermis* is used in cases of diabetes, and great claims have been made for it. *O. Ficus-indica* is grown in the Mediterranean region and in Mexico for its fruit.

7. *Opuntia monocantha* (Pear-fruited Prickly-pear).—Does not spread like *O. inermis*. A native of Brazil. Widely distributed in New South Wales. Britton and Rose adopt the name *O. vulgaris* for this species.

8. *Opuntia Dillenii.*—Rather a dwarf species, but has powerful spines. It is perhaps the most formidable looking of our prickly-pears. At Gayndah, in Queensland, where it is essentially the pear pest, it has spread rapidly. It is known as "Gayndah pear." This species "is composed of many races varying greatly in habit" (Britton and Rose). *O. antillana* is possibly a hybrid of *O. Dillenii* and another species. *O. Dillenii* is a pest pear in Southern India and in Australia.

9. *Opuntia microdasys* (Golden-bristled Prickly-pear).—First recorded as acclimatised in Australia in 1910 in the Pilliga Scrub. It was brought to the district in a pot by the parents of a lady who was living in 1910, and after their death it was thrown into the bush, whence it has spread. It is cultivated in Europe for ornamental purposes. It has no spines, but numerous glochidia. This plant is of relatively small size, the flowers are yellow. It is probably a native of Mexico, though stated to have been first discovered in Brazil.

Anatomy of the *Cactaceæ.*

With the exception of *Pereskia,* upon germination a fleshy shoot appears immediately after the two normally developed cotyledons. This shoot takes over the function of the foliage leaves, and only bears very small foliar structures, some of which are transformed into thorns. The correlation of the structural features with the physiological causes is an interesting study.

The stomatal apparatus is characteristic of the entire order. The guard-cells are accompanied on both sides by one or more cells parallel to the pore. The stomata are found in large numbers on the shoots of the Cacteæ and on the leaves of *Pereskia.* They are generally at the base of saucer-like depressions. The pore in *Opuntia* is more or less parallel to the shoot. The cuticle is in some cases extended from the pore over the entire surface of the respiratory cavity. The hypoderm may be one or more cells thick, and these usually contain an abundance of clustered crystals of oxalate of lime. Cork formation is superficial, and, according to Schleiden, originates in the epidermis. In the wood of some Opuntias, *O. imbricata,* for example, there occur peculiar cells, sometimes spoken of as tracheides, and sometimes as parenchymatous cells. They are broad, thin-walled, with local annular ridges, and have a protoplasmic sac and a nucleus.

Thorns are regarded as leaf prickles by Delbrouck.
Thorns are regarded as emergencies by Caspari.
Thorns are regarded as foliar in nature by Ganong.

Vascular bundles take no part in the formation of the thorns. The epidermal cells invariably possess straight and not undulating walls.

According to Lauterbach, crystal cells form a connected layer beneath the epidermis in *Opuntia;* they are not irregularly distributed. The mucilage cells are found in the whole of the ground tissue: their physiological value as water reservoirs is obvious. The mucilage has a statified appearance around the cell wall. Lysigenous mucilage canals occur in some species, *e.g., O. decumana.* Oxalate of lime is secreted in enormous quantities by some species: in *Cephalocereus senilis* it forms 85 per cent. of the ash. The most widely distributed is the star-shaped cluster crystal compound of monoclinic prisms.

Physiology of the *Cactaceæ.*

In referring to the relation of "a plant" to its environment it has become a common habit to mean the subaerial portion only, leaving quite to one side the subterranean parts. It is obvious that there is no logic in this, for the presence of a plant in its environment must be an expression of the response of the whole plant to its environment. Since the soil acts as a reservoir for heat, the daily course of soil temperature is quite unlike that of the air above it. The nearer roots are to the surface of the ground the nearer do they come to experiencing the variation of air temperatures. The roots of most cacti lie near the surface, and hence soil temperature plays an important part in determining their distribution.

The spread of *Opuntia* in Queensland and in northern New South Wales appears to be due to the response of the roots to the temperature and moisture conditions. The roots, being shallow, will grow most rapidly when the soil is moist at the same time that it is suitably warm, and these are the conditions that obtain in these areas which have a summer rainfall. At Rockhampton, where Opuntias are particularly bad, 50 per cent. of the annual rainfall occurs during December to March. The rainfall at Rockhampton is 40·09 inches, and at Brisbane the soil temperature, depth 1 foot, has a mean between 22·7 to 27·9 deg. C. from October to April. In Northern Africa cacti escape from the oases very little.

In general it may be stated that where cacti are abundant, rain occurs during the warm season, that effective root growth takes place only at relatively high soil temperatures, and that shallow rooting enables them to take advantage of the minimum effective rainfall. Shallow rooting is probably a response to the oxygen supply of the soil.

The respiratory quotient $\frac{CO_2}{O}$ is in general unity. This is far from being the case in *Opuntia*. The phylloclades of *Opuntia* are capable of absorbing oxygen without the simultaneous evolution of carbon dioxide. It enters into chemical combination, since it cannot be extracted with the air pump. The pump fails also to extract carbon dioxide. In green plants generally carbon dioxide is the final term in a series of decompositions. In *Opuntia* the oxygen, having entered, goes into combination, but is not liberated as carbon dioxide. Certain organic acids, chiefly malic and oxalic acids, are formed and remain in the cells. These probably represent the ultimate products of the decompositions. In the *Cactaceæ*, instead of the usual carbohydrates, pentosans are found in large amounts. *O. inermis,* however, stores a considerable amount of starch in the "bulb," and it is the presence of this bulb that renders its eradication so difficult.

The circulation of sap in the plant seems to be slow. When upper joints are poisoned by injection they drop off before the poison has spread far in a downward direction. When a plant is poisoned below the upper pads drop off before the poison reaches them. Any uninjured or partially poisoned pad is capable of giving rise to a new plant; all that seems necessary is that one areole should be uninjured.

Pear appears to be sensitive to very minute traces of arsenic in the atmosphere. I have seen pear even three-quarters of a mile away form a brown corky covering on its pads as the result of spraying distant pear with arsenic trichloride.

(To be concluded.)

Good Varieties Cost no More.

The use of good varieties of field crops results in greater yields. Though increasing yields through improving soil fertility involve both time and effort, the increase due to using superior varieties is obtained without materially increasing costs.

Farmers' Experiment Plots.

WINTER GRASS TRIALS.

Upper North Coast District.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

TRIALS with winter grasses and clovers are at present being conducted with the following farmers:—

F. W. Young, Grafton.
Wm. Weston, Woodburn, Richmond River.
W. A. Parbery, Coridgeree, North Dorrigo.
Graham Johnson, Whisky Creek, Dorrigo.

The above trials have been commenced at various times, the first during the autumn, 1925.

Grafton.—This experiment, consisting of two plots, each an acre in area, was sown on alluvial land which had been under cultivation for some years, and was being turned out to pasture. Planting was carried out on 25th May, 1925, one plot being sown with 4 lb. *Phalaris bulbosa* per acre, and the other with a mixture of Wimmera Rye grass, Giant Fescue, Tall Oat, and Perennial Red clover. Germination was excellent, and conditions were favourable to growth during the early stages.

The *Phalaris bulbosa* did not show up very much until the autumn of 1926, when excellent growth was made after the beneficial autumn rains. The Wimmera Rye made very rapid growth from the start, and dominated the plot in which it was sown. Although eaten down hard, it managed to seed itself down late in the spring. During the autumn this year germination was excellent, and the grass made very good growth. Giant Fescue has made very slow growth throughout. Tall Oat germinated badly, and only a few plants are to be seen throughout the plot.

The Perennial Red clover made excellent growth during the first season, and attained an average height of about 2 feet. The season being an excellent one, and the paspalum pastures supplying the needs of the stock on the farm, the clover was cut for seed purposes at the end of January, 1926. The unexpected extremely dry and hot conditions which followed in February killed out a large percentage of the clover, the roots of which were left exposed after harvesting. There was left on the plot, however, a fair amount of seed, which germinated and came away in the autumn. The plots were eaten down at the end of May, and half of each plot was top-dressed on 2nd June with a mixture of 2 cwt. superphosphate and ½ cwt. sulphate of ammonia per acre. The effect of the top-dressing could be observed a fortnight after the manure was applied, the growth was increased, and the grasses were of a much darker colour than the growth on the untreated area. A very marked improvement was observed in the growth of the clover, particularly the White clover, growing naturally on the area.

Since the dry conditions commenced, the plots have been continually grazed with stock, making systematic observations as to growth impossible, but it is evident that the top-dressed portion has thickened more than the untreated area. Although the plots have been fed-off continually during the present dry conditions, the Wimmera Rye has flowered and seeded; the ability to do so under such dry conditions as are being experienced at the time of writing adds considerably to its value.

Woodburn.—An area which had been under paspalum for thirty years was disc-cultivated, and the plots (each comprising 1 acre in area) were so placed that nine-tenths acre was disc-cultivated and one-tenth acre untreated pasture. The following are under trial:—Wimmera Rye grass, Perennial Rye, *Phalaris bulbosa*, Tall Fescue, Tall Oat grass, Perennial Red, Berseem, and Subterranean clover; lucerne and Golden vetches and Sheep's Burnett.

Planting was carried out on 15th June, 1926, and germination, even on the untreated area, was excellent. Owing to the dry conditions, very little growth was made. The Wimmera Rye has, however, seeded well.

Dorrigo.—On Mr. W. A. Parbery's farm an area of old paspalum pasture was turned over with a mouldboard plough in March, 1925. One plot of Wimmera Rye, lucerne, Perennial Red clover, and Sheep's Burnett was sown on 20th April on the furrow-slices, and portion of the area light harrowed. The remainder of the area was worked down into a fine seed-bed with a disc-harrow, and planted on 26th May in two plots. The grasses used were Giant Fescue, Cocksfoot, Perennial Rye, *Phalaris bulbosa*, and Wimmera Rye; Subterranean clover and Sheep's Burnett were also planted.

The season being favourable, excellent growth was made, and all the grasses established themselves. Wimmera Rye made the most rapid growth, and seeded itself down well. The other grasses were somewhat slower, but made good growth. Sheep's Burnett has done very well, and is very palatable. Subterranean clover has not so far given very good results.

Portion of each plot was top-dressed at planting with superphosphate at the rate of 1 cwt. per acre, but this did not appear to make any appreciable difference to the growth.

In the autumn of 1926 the Wimmera Rye germinated well, and the plots commenced to make good growth. All the plots were eaten down early in June, and portion of each plot was top-dressed with bonedust at the rate of 2 cwt. per acre, P7 mixture at 2 cwt. per acre, and a mixture of 2 cwt. superphosphate and ½ cwt. sulphate of ammonia per acre on 24th June, these manures having previously done well in the pasture top-dressing trial at Dorrigo. From observations made a month later all top-dressed plots were showing up well over the untreated area, the mixture of superphosphate and sulphate of ammonia being the best.

The plots were then grazed off, and owing to the continued dry weather, stock have been on them ever since. When inspected recently, although they had been eaten down continually, the grasses on the top-dressed areas had thickened up considerably, and appeared to have a better hold of the

soil than those on the untreated area. The superphosphate and sulphate of ammonia, and the P7 mixture sections appeared to be about equal, being considerably better than that treated with bonedust, which, in turn, was much better than the untreated area.

It has been noted that most of the ploughing on the Dorrigo is done during early spring, the weather conditions then generally being more favourable than in the autumn. On this account a number of farmers have been making inquiries as to the establishment of winter grasses where paspalum pasture is turned over at this time of the year. With the object of securing data on this point, an experiment has been arranged with Mr. Graham Johnson, Whisky Creek, Dorrigo, who turned over 10 acres of pasture in the early spring. Five acres were planted on 26th November, 1926, with winter grasses and clovers.

The trials so far indicate that Wimmera Rye is the most rapid grower, and where mixtures of winter grasses are being planted it should always be included. Its rapid growth is one of the greatest points in favour of this grass. The other grasses make somewhat slow growth, particularly the first season, producing very little feed until the autumn after planting. It was noticeable also that quick growing weeds did not establish themselves so freely in the plots in which Wimmera Rye was sown as in the other plots.

An Economic Point.

It is not the countries which have the greatest proportion of their people on the land which are contributing most towards the feeding of the world. Up to a certain point, it appears that the smaller the proportion of the people on the land the greater the surplus of farm products! How can this be? Simply by the farmers producing more, because they are better equipped with machinery and labour-saving devices. If this were not so we certainly should be shipping staple farm products to Australia instead of invoking our anti-dumping clauses against their products.—J. E. Lattimer in *The Journal of Agriculture and Horticulture.*

Testing is the Only Guide to Production.

No system of dairy herd improvement that does not provide for testing and culling can be expected to produce the best results. It has been abundantly demonstrated that even good judges of cows fail in estimating the respective butter values of the members of a dairy herd. A cow with plenty of wax in her ears, large milk veins, a capacious stomach, and a rich yellow skin may not be paying her way as a member of a dairy herd. The careful weighing and testing of her milk yield, and the setting out of the results in pounds of butter-fat, for one whole period of lactation, will give her value as a member of the herd in an accurate and business-like way.—F. T. Boller at the South Coast and Monaro Agricultural Bureau Conference.

IMPORTS AND EXPORTS OF FRUIT.

THE following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 31st December, 1926:—

Description.	Imports.	Exports.
Interstate.		
	Cases.	Cases.
Fresh Fruits ...	418,437	195,171
Tomatoes ...	122,372	...
		Bus.
Melons ...	......	2
	lb.	lb.
Canned Fruits ...	47,852	1,064
Dried Fruits—		
Unspecified ...	5,488	336
Currants ...	9,772	336
Raisins ..	8,568	224
Apricots ...	1,904	...
Apples ...	3,920	...
Peaches ..	7,224	224
Pears	672	...
Prunes ...	3,556	896

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Citrus	....	744	18,448
Apples ..	....	..	256
Bananas ...	....	1,391	...
Pears	....	...	71
Pineapples ...	....	317	505
Other	....	744	2,257
Dried Fruits—		lb.	lb.
Apples, Pears, Peaches, etc.	U.S.A.	2,800	...
Apples ...	....	...	2,252
Apricots ...	....	...	1,092
Currants ..	....	...	45,124
Prunes ...	United Kingdom	12	669
,, ...	France	1,528	...
,, ...	U.S.A.	69,874	...
Peaches ...	....	...	828
Raisins—			
Sultanas ...	....	...	1,940
Lexias ..	....	...	56
Other ...	France	3,787	1,549
	United Kingdom	720	..
	Spain	38,985	..
	U.S.A.	10,938	
Dates	Algeria	6,912	7,112
	Mesopotamia ..	4,159,125	...
	India	37,700	...
	France	208	...
Other	Asia Minor ...	96,989	1,896
	China	16,371	...
	Fiji	56	..
	France	1,251	...
	Greece	584	...
	Spain	2,148	...
	Syria	300	...
	Turkey ...	37,494	...
	United Kingdom	510	..
	U.S.A ..	34,876	...
Preserved in liquid—			
Apricots ...	....	...	302,001
Peaches ...	....	...	121,524
Pears ...	....	...	11,373
Pineapples ...	....	...	1,363
Raspberries	....	...	1,572
Other ...	....	...	13,892

"DRINK more milk" is advice that cannot be too often repeated. The food value of pure, clean milk is not realised by the average citizen. Because milk is a fluid and is not chewed like a turnip, many people think of it only as a drink; yet in fact, a pound of milk contains more *solid* food than does a pound of turnips.

Cheese—A Valuable Article of Diet.

A. A. RAMSAY, F.C.S., Chief Chemist.

CHEESE is one of the oldest forms of food used by man. Its use is probably almost, if not quite, as old as that of wine. From the earliest of times use has been made of natural ferments to prepare food from raw products. In the case of cheese, milk was the raw product, and the must of the grape in the case of wine—both being subjected to fermentative processes in the production of the food named.

The term cheese is given to the product obtained from milk by coagulation of the casein and by subjecting the solid product obtained to a process of ripening and fermentation during storage at convenient temperatures for varying periods of time. The ripened cheese is changed in chemical composition, mostly as a result of fermentative action on proteids, which are changed into more soluble forms, and at the same time flavour and aroma are developed. The final product varies, not only with the nature of the original product used, but with the method of preparation, the nature of the organisms and ferments present, the action during the ripening period, and with the time and temperature of storage.

In most countries cheese is made exclusively from cow's milk, but certain kinds are also manufactured from the milk of sheep and goats. The characteristic flavours possessed by various kinds of cheese are in the main due to the details of the process of manufacture.

The art of the cheese-maker might be said to consist of establishing conditions that favour the development of the special kinds of bacteria specially implicated in the ripening of the particular kind of cheese required. By carrying this into practice, cheeses indistinguishable from numerous foreign varieties have been successfully produced in countries other than that in which the variety originated.

Thus cheddar cheese, which was originally made in England centuries ago; stilton, which is another old English production; gruyerè, which was originally produced in Switzerland; and Edam, originally made in Holland, are now produced in this and other countries and sold under the name of cheddar, stilton, gruyère, &c. It is perhaps unfortunate that the name of the original type of cheese is used without qualification, and it is a debatable question whether the name (without qualification) should not be restricted to the particular cheese as made in the country of origin. The excuse advanced for retaining the original name is that they are cheeses of the same type, but because the taste, odour, and flavour of a cheese made in one country, say, Australia, imitates or resembles to some extent that of a cheese produced in the country where such variety of cheese originated, it does not follow that the foreign name should necessarily be given to the same article produced in the second country any more than that the names of port, sherry, or claret should be applied (without

qualification) to similar types of wines produced in that same country. The underlying principle involved in this contention has been given effect to with regard to wines, and similar action might well be taken in regard to cheese.

The amount of water, fat and protein in the same type of cheese as manufactured and produced at different places or countries varies considerably. The range of such constituents is indicated in Table I, which shows the maximum, minimum, and average of the constituents mentioned found by analysis in cheddar cheeses of American and English types. The figures are interesting as indicating the limits within which each constituent falls, but since the figures representing the percentages of water, fat, and protein do not refer to the same (individual) cheese, the data do not enable us to deduce the composition of any of the many samples examined. Other types of cheese also vary in composition, and it is therefore difficult to state exactly what is the average composition of the various types of cheese.

TABLE I.—Composition of American and English Cheddar Cheeses.

	Percentage.			
	Water.	Fat.	Protein.	Ash.
American (5-months old, Van Slyke)—				
Maximum	38·10	44·43	30·09	4·59
Minimum	29·85	27·22	21·53	2·72
Average	34·01	36·81	25·67	3·50
English (Voelcker)—				
Maximum	39·43	41·58	32·27	4·31
Minimum	30·32	23·21	23·28	2·06
Average	35·16	30·45	27·80	3·42

The composition of the cheddar type of cheese produced in New South Wales is of considerable interest, and is shown in Table II. The figures were obtained as a result of examination of samples representative of this class of cheese as sold on Sydney market.

TABLE II.—Composition of several New South Wales Cheddar Cheeses.

	Water.	Fat.	Dry Matter.	Per cent. Fat in terms of dry Matter.		Water.	Fat.	Dry Matter.	Per cent. Fat in terms of dry Matter.
	per cent.	per cent.	per cent.	per cent.		per cent.	per cent.	per cent.	per cent.
1.	36·99	36·39	63·01	57·8	8.	34·88	37·80	65·12	58·1
2.	36·72	34·37	63·28	54·3	9.	33·23	32·62	66·77	49·0
3.	37·15	34·85	62·85	55·5	10.	35·58	35·82	64·47	55·6
4.	32·84	36·75	67·16	54·7	11.	32·31	35·70	67·69	52·7
5.	34·95	35·58	65·05	54·7	12.	32·49	36·77	67·51	54·5
6.	40·12	33·95	59·88	56·7	13.	36·16	34·64	63·84	54·3
7.	36·43	36·50	63·57	57·4	Average	35·27	35·52	64·68	55·0

Inspection shows that the percentage of water ranges from 32·3 to 40·1, averaging 35·4. Fat ranges from 32·6 to 37·9, averaging 35·5. Fat expressed in percentage of dry matter ranges from 49·0 to 58·1, averaging 55·0.

The amount of cheese consumed annually per head of population in New South Wales is about 3½ lb., while in England the consumption approximates 10 lb. per head, which affords an indication of the possibilities of the future development of the cheese industry in this State.

A few years ago luncheon cheese, processed and put up locally in small tin containers, appealed to the public taste and found ready sale, but within the last few years imported cheese put up in small segments covered with tinfoil, and a number of such segments packed in a neat cardboard container, has attracted particular attention. When cheese is purchased from the grocer in half or one pound portions it soon dries up in this climate, and in ordinary households the last portions are not so attractive or palatable as when the cheese was first purchased. In the case of the segments referred to—the quantity in each segment is small, is readily used at one or at most two meals, and for subsequent meals a fresh segment is available, which shows no loss from mould or drying, and which is just as palatable as when purchased. It is possibly this feature which has so appealed to the public taste and fancy.

With a view to ascertaining the composition of "processed" cheese on the local market, fifteen samples were purchased and examined at the Chemist's branch. The results of the analyses are given in Table III. The percentage of fat in terms of dry substance is also given, and the probable composition of the original milk has been computed on the assumption that neither the actual nor the relative amounts of fat or of solids not fat in the cheese as examined have been altered in the processing treatment from that occurring in the original milk used and treated.

The fact must not be overlooked, however, that it would be perfectly possible to incorporate, not only water, but also fat and other constituents in the manufacture of processed cheese—consequently the analytical data regarding the composition of processed cheese, while of considerable interest as indicating the composition of the article as vended, would be of little, if indeed, of any value in connection with the question of determining suitable standards.

Study of Table III will show that the composition of processed cheese varies considerably. The percentage of water ranges from 24·6 or 30·4 to 55; fat from 2·3 or 6·1 to 37·8, and the percentage of fat in dry matter from 3·1 or 19·6 to 58·6. It is interesting to note, however, that in samples Nos. 1, 8, and 15, which are locally produced, the fat content is over 30 per cent., and the fat in dry matter 51, 54·2,and 53·4 respectively.

The food value of many of the products represented in Table III is considerably less than that of the products represented in Table II, whatever may be their value as condiments or accessories in a diet. This fact cannot be too strongly emphasised, as well as the fact that every pound of

imported cheese displaces a pound of New South Wales cheese on the Australian markets.

Type of cheese.	How packed.	Water.	Fat.	Fat in dry substance.	Probable Composition. Original Milk. Fat.	Probable Composition. Original Milk. Solids not Fats
		per cent	per cent.	per cent.	per cent.	per cen
1. Cheddar (Processed).	Rectangular block in tin foil .	35·39	32·97	51·0	3·45	9·11
2. Swiss Gruyère ..	Segments in tin foil	43·58	25·12	44·5	2·93	9·01
3. Cheddar Processed	Segments in tin foil ...	41·11	28·39	48·2	3·36	9·12
4. Camembert ..	In paper-lined tin	48·85	24·25	47·4	3·35	9·12
5. Skim milk ...	Truncated cone in tin foil ..	24·61	2·36	3·1	0·35	9·31
6. Camembert ...	Segments in parchment paper packed in tin.	55·35	23·91	53·6	4·49	9·01
7. Cheddar ..	In glass jar	48·45	24·43	47·4	3·34	9·12
8. Cheddar ...	In small tin	30·39	37·76	54·2	4·13	9·01
9. Cheddar	In small tin	46·81	25·35	47·7	3·35	9·12
10. Gruyère	Segments in tin foil	32·31	25·38	37·5	3·78	9·23
11. Partly skimmed ...	Segments	47·05	19·18	36·2	2·13	8·41
12. Partly skimmed ...	In tin paper-lined .. .	69·01	6·07	19·6	1·13	9·33
13. Roquefort ...	In small tin	39·42	31·47	51·9	3·87	9·07
14. Pimento	In small tin	41·35	28·88	49·2	3·50	9·11
15. Cheddar	In small tin	31·84	36·42	53·4	4·02	8·97

Just as the butter industry has been developed by standardisation of raw products, methods of manufacture, and of the manufactured product, so it appears reasonable to suggest that the development of the cheese industry will be along similar lines, and the production of high class products. In one of the year books of the United States Department of Agriculture it is stated that, "the best milk makes the best cheese and the most of it; the milk which is the most profitable for butter is also the most profitable for cheese; the best butter cow is the best cheese cow." This suggests the desirability of manufacturing "whole milk" cheese.

O'Callaghan states that the average composition of Australian milk throughout the year may be set down as follows:—Water 87·20, fat 3·90, casein 3·00, albumen ·45, lactose 4·70, ash ·75. Van Slyke states that the average composition of factory milk in New York is—water 87·33, fat 3·75, casein 2·46, albumen ·68, lactose and ash 5·78.

Taking the average fat in milk as 3·8 and of casein as 2·5 to 3 per cent., and assuming that 9 per cent. of the total fat in the milk is lost in the whey (a very conservative estimate), we would have a ratio of fat to casein of 3·46, to 2·5 or 3·0, or 1 to ·72 or ·86. The fat expressed in percentage of dry matter (fat plus casein) would be 58·1 or 53·5. Even assuming that fat in milk is 3·2 per cent. the casein remaining as stated, the fat expressed in terms of dry mattr would be 53·8 or 55 per cent., the ratio of fat to protein being 1 to ·86 or 1 : 1.

From investigations carried out at New York Experiment Station in connection with the manufacture of cheddar cheese, it was found that the ration of fat to protein was:—Lowest, 1 to ·79; highest, 1 to ·63; average 1 to ·7. Using these ratios and assuming 5 per cent. to represent the ash plus substances other than fat or casein in cheese, the fat expressed in

percentage of weight of dry matter in cheese would be 53·0 per cent. for highest ratio of protein, viz., 1 to ·79, 58·3 per cent. for lowest ratio, and 55·9 for average ratio.

Again, taking the highest ratio of fat to protein, viz., 1 to ·79, cheese containing 33 per cent. of water would contain 34 6 per cent. fat, and cheese of 35·0 per cent. water would contain 33·5 per cent fat. The percentage of water in the cheese would require to be 100 — $\left(\frac{30 \times 100}{55 \cdot 8} \times 5\right)$ = cheese of 35·0 per cent. water would contain 33·5 per cent. fat. The percent.

Hard pressed cheese made from whole milk should therefore easily contain 30 per cent. fat, and the fat, expressed in terms of dry substance, should easily exceed 50. Such a standard could easily be attained, while leaving the manufacturer ample latitude. As the cheddar method, with modifications, is generally used in this State for the manufacture of softer types of cheese containing relatively high percentages of moisture, it appears desirable to suggest that the fat expressed in terms of dry matter in such cheese should not fall below 50 per cent.

The Real Worth of Silage.

In a discussion on silos and silage at the recent South Coast and Monaro Conference of the Agricultural Bureau, Mr. E. H. Filmer stated that he had been thirteen years on his farm and had never yet seen a season when it was not possible to fill a 200-ton silo. They got dry spells, but always they could get a growth sufficient for silage purposes. He himself had proved how useful silage was: he had a little silage on hand last December but used it very sparingly because he feared that in January and February feed might be even scarcer. In consequence, his returns from the factory declined so that they were £150 behind what they should have been in the two months. With a full silo he would have been saved that heavy loss.

Strengthen the Chain.

The strength of a chain is determined by its weakest link. Concentrate, therefore, on the weakest links of farming, such as self-satisfaction, absence of lofty aims and of plan and system, injudicious work, unscientific methods, faulty linking together of farming enterprises and farmers' interests, defective co-operation between individual farmers, and the farmer and the Department of Agriculture.

The strength—the profitableness—of the farming chain can be increased by strengthening its weakest links, *i.e.*, a recognition by the farmer of the shortcomings of his farming and a consequent aim at higher standards, more purposiveness and systematisation, more judicious work, more scientific knowledge, and a closer connection and friendship between farmers and the Department of Agriculture.—F. E. Geldenhuys, Under Secretary for Agriculture, in ***Farming in South Africa.***

Calf Rearing.

P. WALLER, Senior Dairy Instructor.

UNFORTUNATELY calf rearing is generally regarded as the most irksome part of dairy-farming routine, and in accordance with this view the young animal is apt to get a corresponding lack of care and attention. The result is the calf is often ill-fed and uncared for, and is therefore subject to diseases that exact a heavy toll up to the age of three months old. As animals of heavily productive strains are usually highly developed and more easily affected by adverse conditions than lower class stock, it is among the most promising animals that the losses are greatest. The survivors under the above system, moreover, are likely to be debilitated and to lack the natural stamina necessary to the animal that is to become a heavy milker.

Care in calf raising is of greatest importance to the animal's future production, and the best authorities on dairy stock agree that many cows are spoiled by poor feeding during their first six months. It is certain that an underfed and impoverished calf will never be as good a producer as if it were well fed and tended in its first year, which is the period that really determines the animal's constitution.

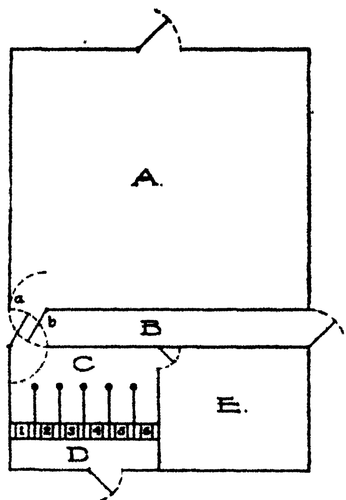
"A Little and Often."

For success in calf rearing we must adopt methods which most nearly resemble natural conditions. The young calf's motto in regard to food is "a little and often." The calf should, therefore, be allowed to remain with its mother for one or two days in a small paddock, or better still, it should be penned away from its mother and given access to her two or three times a day. In the case of heavy milkers, it is advisable to take some of the surplus milk from the cow first, as this makes it possible for the calf to draw all the milk away and thus cleanse the milk sooner. The advantage of this procedure is that it allows the calf as much colostrum as it will take; this substance, with its high content of albumen and its laxative properties, is specially designed by nature for the newly born calf, which is greatly handicapped if the provision of nature is withheld, as happens when the calf refuses to drink from the bucket for the first day or two.

The calf should not be allowed to remain with its dam for longer than two days, unless it is delicate and valuable enough to warrant extra attention. Generally, it will be found best for both cow and calf if the latter is removed when 24 hours old, as the youngster then usually learns to drink sooner, and the dam frets less. Occasionally one which obstinately refuses to drink when one day old is found.

Feeding.

For the first week at least, feed the calf one-half gallon of its mother's milk thrice daily; later this may be gradually substituted for 1 gallon of skim milk fed twice daily. Some form of concentrate as oil-cake, crushed linseed, maize-meal or pollard, should be added to the skim milk to develop a sounder digestive system and enable calves to grow into heavier producing cows, or into steers which put on weight more rapidly. Each calf should be fed separately. The practice of feeding in tubs or troughs is strongly condemned, as it allows the fast drinkers to get too much milk at the expense of the slower ones.



Diagrammatic Sketch of Calf Yard and Feeding Bails.
[Not to scale.]

A. Assembling yard. B. Wide crush or lane to take calves away after feeding C. Shed with small open narrow bails to keep calves from reaching into next animal's food. D. Compartment where milk is brought and tipped into feeding buckets. E. Pen for small calves till old enough to let out into calf paddock. *a* and *b*, gates which swing right back and allow animals to be turned in any direction desired. 1 to 6, skeleton mangers to hold buckets or kerosene tins cut in half and turned over a wire beading for strength and convenience in handling.

It is worth while erecting proper conveniences for calf feeding, because of the time saved by their use. The calves are then held in a small yard and let out six or more at a time as required, to feed in small fixed bails. In, or at the head of these bails, there are compartments which prevent the feeding buckets from being tipped over, and these are so arranged that no calf can touch the other's food. As each calf finishes it is turned away in another direction and secured against interfering with those that are being fed. The floor of these feeding stalls should be concreted, so that they may be kept in a sanitary condition. For convenience, a pen for young calves could adjoin this and both be roofed over as a protection against the weather.

Calves should be turned into a good pasture by themselves so they have not to compete with cows for the best grass, and also to lessen the risk of getting back with their mothers or forming attachments for other cows, as

often happens when cows and calves run together. They should always have access to rock salt or a good salt lick which furnishes the mineral matter essential to digestion and rapid growth.

Essentials of Calf Rearing.

The essential features of calf rearing may be summarised as follows:—

1. Always handle calves quietly and patiently, and so develop in the animal a sense of confidence in the human foster parent, which will remain till the calf reaches maturity.
2. Feed at regular times each day.
3. Always give the calf a regular quantity of milk.
4. Feed only perfectly clean sweet milk.
5. Feed the milk at body temperature (about 100 deg. Fah.).
6. Always cleanse feeding buckets as rigidly as you would all other dairy utensils. All the above points have a big bearing on the calf's digestive system, and will eliminate the common causes of calf scours.
7. Provide shade in summer and shelter from winter wind and rain, because it is cheaper to conserve animal heat and energy by these means than by the use of larger amounts of food.
8. Always make a point of picking up pieces of rag, paper, twine, &c., if found about the calf paddock. Young calves exhibit a mischievous delight in picking up foreign substances of this description and ultimately swallowing them. Indigestible material of this nature, when eaten by young calves, is almost certain to set up a serious form of gastro-enteritis.

The Characteristics of Gidgee Oats.

This variety, which is a crossbred resulting from the mating of two strains of White Ligowo x Algerian, seems more adapted to inland than to coastal conditions, and should be sown late or else fed off if sown at all early. It has done well at Trangie Experiment Farm.

It gives more length of straw than Lachlan, is of the same season as Sunrise, than which it stools rather less, and has stout, medium-coarse straw, which is purple and in some seasons inclined to be brittle. The awned grain is remarkably plump, brown, and of medium length, and suitable for feeding to sheep in drought, as it is easily picked up.—H. C. Stening, Chief Instructor.

Prepare for the Crop.

The preparation of the land for seeding should be governed by two factors —by the needs of the particular plant which is to be grown, and by the character of the land. To prepare a seed-bed for any crop, the habits, likes, and dislikes of the plant should be studied; that is, it is not enough that the land be well prepared—it should have the kind of preparation which is demanded by the crop.

Early Tomatoes in the Metropolitan Area.

J. DOUGLASS, H.D.A., Agricultural Instructor.

THE methods followed by Mr. A. G. Johnson, a successful grower of Green Valley, *via* Liverpool, and the results he has obtained, should prove of interest and value to tomato-growers generally. The system of raising the tomatoes is that known as the "single stem system," practised at Hawkesbury Agricultural College and recommended by the Department of Agriculture.

Mr. Johnson has many original ideas, which are very practical, labour-saving, and interesting. He has been raising tomatoes for the early and late markets for the past eleven years, though it is only in the past two or three seasons that he has gone into the crop on a large scale. The early crop for the past season (1926-27) was 2 acres in area, and was undoubtedly one of the most successful crops ever grown in New South Wales. The yield, monetary return, and average price per half case must constitute a record for a crop of such an area.

The country around Green Valley is undulating and very patchy. The winter rainfall is good, but during the summer it is subject to hot, dry spells. There is a great variation in the types of soil, patches of good brown loam to heavy clayey loam being met with, and it is on this soil that the best results are obtained. Outcrops of slatey loam, heavy red clay, and white pipeclay, with traces of ironstone, are very common. The subsoil through the whole district is impermeable clay. Fortunately the land is undulating and the surface drainage fair.

Seed Frames.

It is in the construction of seed frames, the preparation of the seed-beds, and the raising of plants that this grower excels. The frames are original in construction, cheap to build, and contain many ideas that are worth mentioning. The design is simplicity itself, at the same time giving the seedlings the maximum amount of sunlight, warmth, and protection.

Each frame measures 16 feet x 3 feet 6 inches. The approximate cost of material is £2, to which has to be added the cost of construction, although a handy farmer could build his own frames. Seven sheets of corrugated iron, each 8 feet in length, are used in the construction. Two sheets are used in the front, four at the back, and the remaining one is cut into halves and used at the ends. The uprights are 3 x 2 inch hardwood, and are let into the ground.

The rails supporting the roller blind are 1 x 1 inch hardwood, bored and fitted with one nail at the top to allow them to be moved. The bottom of these support rails are let into slots cut on the bottom plate. By making these support rails movable (see photograph) the frames can be worked

without any inconvenience, and unbroken sunlight can be given to the plants without reducing the efficiency of the frames. The blind is made of nine wheat bags opened out, and sewn together, then attached to a convenient roller at one end, and to the top plate at the other end. At one end the roller is fitted with a windlass handle, which allows an operator to conveniently adjust the blind with the minimum of trouble. As the half sheet of iron does not completely enclose the end of the frame, a single bag has to be used during frosty weather.

A Hot Frame, showing Depth of Manure used for Heating Purposes.

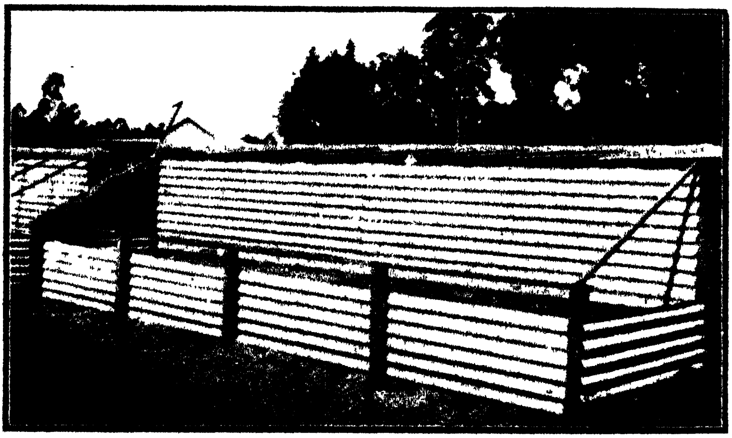
It will be seen that when the blinds are up the plants have no covering and are exposed to the sun. This ensures that the plants at the back have the same conditions as the ones at the front of the frame. A common mistake of many growers is to have a roof or some protection constantly over the frames. This usually results in weak, spindly plants, and those situated at the back grow tall, and bend towards the front seeking sunlight.

Mr. Johnson's frames have a northerly aspect, and the two top back sheets of iron trap and reflect the sunlight, thus giving the plants every advantage. The plants are also perfectly protected from the cold southerly winds experienced during July and August.

Mr. Johnson has twelve of these frames, five of which are used as hot beds for raising the seedlings; the whole twelve are filled at transplanting time. Each frame holds forty-five boxes specially constructed for this work, the inside measurements of which are 12 x 12 x 3 inches. These boxes cost 4d. each, and last about three seasons. Each one is well nailed, excepting

on one long side, which is only held by one nail at each end. This feature allows the side to be easily removed when the box is taken to the field, and facilitates the removal of the plants. These boxes are filled with virgin soil obtained from the bush, mixed with a little superphosphate.

The hot frames are prepared at seed planting time by placing and tramping 2 tons of fresh organic (poultry or horse) manure in each of the five seedling frames. When manure is scarce the residue of cabbage crops, &c., can be used to make up the bulk. This 2 tons of filling is to generate heat, and must be fresh, unfermented, and well tramped in the frames. Immemediately above this layer of heating material is placed 5 inches of prepared soil. This soil is prepared by mixing with lime and stacking it in heaps or in the frames when not in use.



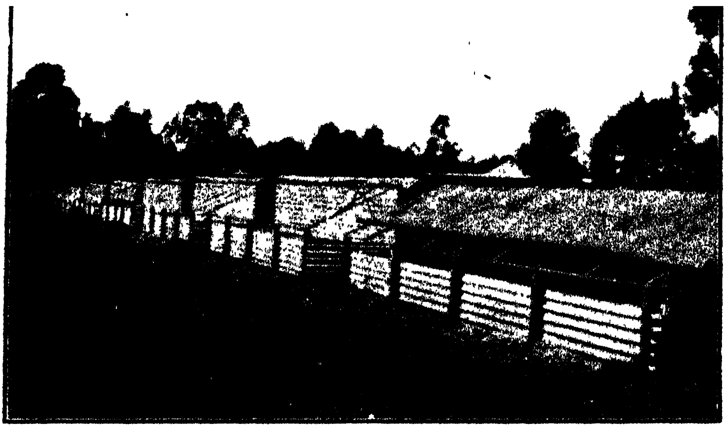
View of Frame, showing Rails up.
This allows maximum sunlight and facilitates weeding and working operations

The boxes, prepared as outlined, are then placed on this soil layer. Great care is taken to see that they are placed as close together as possible, and that all cracks are filled with soil. The spaces between the outside boxes and the sides of the frame, and any other air spaces are also carefully filled and packed with soil. The whole surface of the beds is now covered with a sterilised mulch three-quarters of an inch deep. This mulch consists of decayed poultry manure, which is sterilised by being baked on sheets of iron over a fire. This treatment helps to keep down disease, to destroy insects and insect eggs, and to kill weed seeds. Poultry manure is specially selected because it is relatively free from weed seeds and fine in texture.

For the early tomato crop the seeding period usually extends from the middle of May to the middle of June. The seed is sown broadcast and covered with about a quarter of an inch of soil. About half an ounce of seed is required to sow each bed; as five beds are sown this means that 1¼ oz. of seed are ample to plant an acre. The boxes are constantly watered, but are only kept moist—not wet.

It must be remembered that sowing takes place in the winter, but the bottom heat makes the conditions suitable for the germination of the seed, which is usually completed within seven to nine days. When the plants are well up in these hot beds they are thinned out to a distance of from 1½ to 2 inches between plants, the object being to encourage the growth of short stocky plants rather than tall sappy ones. By the time the plants are ready to transplant the frames are losing their heat.

The seedlings are 3 to 4 inches high when transplanted, which takes place from about the end of June onward. The boxes into which the plants are removed are identical in every respect to the seedling ones. Twenty seedlings are planted on the square system in each box, being spaced 3 x 2½ inches apart. The frames into which these transplants are placed have no bottom heat and are only filled with soil. The boxes are placed on the soil in the same method as in the seedling frames, and again top-dressed



General View of the Frames.
The blind is partly drawn on the first frame and the rails are adjusted on the second.

with sterilised poultry manure. As the plants receive a slight throwback at transplanting time, the blinds are lowered for a day or two for protection until they have recovered. As the weather during July and August is very changeable the plants require constant attention.

Watering is carried out about once a week, a thorough saturation being given each time. When the weather is fine, but not too hot, the blind is completely rolled up; then, again, in very hot weather the blind is lowered half-way down during the hottest portion of the day, but later in the afternoon is again raised. In boisterous weather, when there is danger of damage from heavy rain or hail, the plants are completely covered. Advantage is taken of all the sunlight available, the covers being rolled up at dawn and lowered at dusk.

Apart from the general treatment, the first means taken to harden off the plants is to leave the bags off the ends of the frames at night. During August the covers are left off all day, and even at night when there is no

danger of frost. Watering is also slightly reduced with the object of making the plants sturdier. One week before transplanting the covers are left off the frames all the time—day and night. The day before transplanting the beds are thoroughly saturated so that the soil will be in a condition to hold together when being removed from the boxes.

Field Transplantation.

The laying out of the field in readiness for transplanting takes some time, and must be very accurate, as the plants are now to be placed in their permanent positions. The piece of land on which this crop and the Departmental experiments were planted was virgin soil, which had been cleared during 1925. The land was first broken up with a mouldboard plough during

A Barrow used for Taking Plants to the Field.

February, 1926. Cross-ploughing was carried out in the first week in August, 1926, and the land reduced to a medium fine mulch by harrowing twice. Previous to the second ploughing this land was dressed with 1½ tons of agricultural lime per acre.

The plants are set out on the rectangular system, the rows being 3 feet 9 inches apart and the plants spaced 2 feet apart in the rows. It is found that 5,000 plants are required to plant an acre at this spacing. Base lines are first marked out at the top and bottom of the field, and furrows ploughed out at right angles to them, 3 feet 9 inches apart. Fertiliser is then distributed along the furrows, cultivated in, and the land levelled with a harrow. A planting line marked every 2 feet is then stretched along the position of the furrows, between the base lines. At each mark on this line a training stake is driven in the ground. It is found at the end of this operation that the stakes are placed evenly in line in both directions. They are 6 feet long, 1 inch square hardwood, pointed at one end, and cost £5 5s. per 1,000. For convenience in handling they are tied in rectangular bundles

of 25; this is done when they are being taken up after the previous crop. These bundles have been dipped in a bluestone solution before being stacked, with the object of destroying any disease spores, or insects, which might be carried over to the next crop. After the stakes are placed, the boxes are brought to the field, six at a time, in a specially constructed barrow. This barrow, as shown in the photograph, is very handy, light in structure, and has a bicycle wheel, which makes it very easy to push over ploughed land.

The boxes now have the side removed which is only secured with two nails. A knife is next drawn through the rows of plants in both directions, cutting the soil in blocks, each of which contains a single plant. It will be seen how easy it is to remove a single plant with a block of soil attached

Young Tomato Plants in the Field.
Kerosene tins as protection.

without disturbing the roots. A good watering is given with this final transplanting, which takes place during the last two weeks in August. Two men can plant and water 1,000 plants per day. As the weather is mild during August it is found that the final watering is sufficient to carry the plants over for about five weeks.

In one of the photographs it will be seen that the earliest plants are protected with half kerosene or benzine tins. These are prepared by removing the top, cutting the tin in halves diagonally, and punching a hole through which the stake can be pushed. Undoubtedly this covering protects the plants from hail, wind, and rain, and it prevents damage from frost. It also enables the plants to be removed to the field earlier than the unprotected ones, to obtain earlier fruit. However, it is very problematical whether the advantages compensate for the cost, as the very early fruit is of poor quality, and the extra labour necessary in preparing, setting up, and removing the tins is a heavy expense. It must also be borne in mind that the plants do better if left in the frame for the extra time, and field conditions are more

suitable for quick growth at the later date. Small growers would find these protections suitable, but on a big scale the initial outlay and labour is too expensive.

Crop Management.

Watering in the early stages tends to make the soil cold and keeps the plants back. For this reason irrigation is held back as long as possible. Thorough cultivation to destroy weeds and aerate and sweeten the soil is most essential.

A most important feature, especially in this type of soil, is the fertilising of the crop. Mr. Johnson has had good results from a complete manure put up by a proprietary firm. The cost of this fertiliser is £11 7s. 6d. per ton, and the guaranteed content is:—Phosphoric acid, 10·7 per cent.; nitrogen, 2·5 per cent.; potash, 7·2 per cent. At field transplanting time half a ton per acre of this fertiliser was distributed. Later, during October, a shallow furrow was ploughed down every second row of plants, and a quarter of a ton per acre spread along and cultivated in. The alternate rows were dressed in the same manner with the same amount of superphosphate at the end of November.

(*To be concluded.*)

The True Aim in Testing.

The opinion is held by many dairy-farmers that testing as at present carried out does not give a true record of a cow's capacity to produce butter-fat, because under normal conditions very few cows produce as much as they could produce if they received all the food they needed. The truth of this must be generally conceded. But no dairy-farmer is very hopeful that his cows will get all the food they can consume every day, right throughout the year. The advocate of herd-testing does not attach any importance to this phase of the question: the chief aim of herd-testing is not to record abnormal results.—E. T. Boller at the South Coast Bureau Conference.

The Toll of Flag Smut.

Flag smut is still considered to be the most serious disease throughout the wheat belt. It was responsible for a loss of approximately 2,000,000 bushels of wheat in New South Wales last season. When favourable conditions of moisture and temperature are present the spores of the flag smut fungus germinate or shoot, and if young germinating grains of wheat are also present the fungus is able to penetrate the small wheat shoot and establish itself in the developing wheat plant. Control measures for this disease are aimed at destroying the fungus (i) by burning stubble, (ii) by pickling or dusting the grain to kill spores present on the seed coat, and (iii) by bare fallow and rotation with a resistant crop like oats, which provides no opportunity for the flag smut fungus to become established in the wheat plant, thus eventually starving the fungus out of the soil.—Dr. R. J. Noble at Albury Bureau Conference.

Farmers' Experiment Plots.

THE EFFECT OF SUMMER FODDERS ON SUBSEQUENT WHEAT YIELDS.

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

IN the Cumnock district, where farms are comparatively small and land values comparatively high, it is considered by some that the soil could be made to yield greater returns than those obtainable from wheat alternated with bare fallow in conjunction with sheep grazed on the stubbles and fallows. The rainfall is sound and above the general average for wheat-growing districts and climatic conditions are not severe, and there are those who think a fodder crop could be grown before the wheat with safety and profit.

With the object of testing this, a trial was conducted last year in co-operation with Mrs. J. Berney, of "Kildara," Eurimbla, in which certain areas were sown with summer fodders, grazed off, and followed by wheat, in order to ascertain the effect of the summer fodders on wheat yields in comparison with an area of bare fallow.

An area of 15 acres of rich chocolate limestone loam was set aside for the trial. It was mouldboard ploughed early in September, 1925, and harrowed and springtoothed early in October. Areas of 5 acres each of Sudan grass and Japanese millet were sown on 2nd November at the rate of 10 lb. seed with 50 lb. superphosphate per acre, the seed being mixed with the manure.

The centre block of 5 acres was left unsown as bare fallow. In spite of a very light rainfall in September (35 points) and October (85 points), germination was satisfactory, and a good fall of 2¼ inches in November insured rapid growth. Both blocks were fed off early in January by 300 sheep, which were maintained for three weeks on this summer feed. Decided preference was shown for the Japanese millet, but the best grazing results were obtained from the Sudan grass.

The summer turned out exceedingly dry, and the Japanese millet failed to grow again, but an additional two light grazings were obtained off the Sudan grass for short periods by the same number of sheep. The residues were then mouldboard ploughed under early in April after heavy rains (871 points) in March. Frequent rains during April and May, aggregating 684 points, prevented the land from being worked, and it was not until June that the whole area of the trial could be reploughed and sown with a combine drill on 28th June, using 60 lb. Waratah graded wheat and 80 lb. superphosphate per acre. The effective rainfall on the growing crop was 560 points.

The following were the results :—

Variety.	Area.	Yield per acre.	
	acres.	bus.	lb.
Waratah wheat after Japanese millet ...	4·33	15	39
Waratah wheat after Sudan grass	4·02	20	33
Waratah wheat after bare fallow	3·96	23	29

The above results for the year in question show that summer fodders sown on a fallow have a retarding effect on the ultimate wheat yield or main profit crop.

While the results from the Japanese millet plot are probably not a true test owing to unfavourable location and waterlogging of portion of area, the increase of 3 bushels in the yield of the bare fallow plot over the Sudan grass plot is a reasonable guide. It would be necessary to make not less than 20s. per acre out of the sheep to warrant this method of rotation on high-priced farming soils.

The experiment is being continued for another year.

Infectious Diseases Reported in February.

The following outbreaks of the more important infectious diseases were reported during the month of February, 1927 :—

Anthrax	Nil.
Pleuro-pneumonia contagiosa	12
Piroplasmosis (tick fever)..	Nil.
Blackleg	1
Swine Fever	Nil.

—Max Henry, Chief Veterinary Surgeon.

Will it Grow Lucerne?

It is seldom safe for a farmer to say that lucerne will not grow profitably on his land before he has tried it. It is usually associated with rich alluvial soils, but while the best results are obtained from such land, it also thrives on a wide range of soils that do not possess the depth or fertility of the rich alluvials. It is sensitive in certain respects, and disregard of its special susceptibilities will result in reduced yields, but payable results may be expected from almost any land, except that which is badly drained or is very sandy. The plant roots very deeply, and it is obvious that a deep, permeable subsoil contributes to maximum results; but this is not an absolute essential to successful growth, as is proved by the results obtained on soil that at one time would have been considered quite unsuitable.

Generally speaking, autumn is the best time for sowing. Pamphlets on ucerne production are obtainable free from the Department.

Strap Grafting.

E. J. LINDSAY, Orchard Inspector.

In preparing fruit stock for strap grafting, cut down in the usual manner at the height at which it is desired to work the tree. It is usually advisable to graft the tree as low as possible, but the branches must not be cut off too close to the trunk, as at this point they grow out at such an angle that when the graft is inserted it is not "sitting" perpendicularly enough, and is in consequence less strong and more likely to break off. As far as possible a section of the branch that is fairly free from old cuts or scars should be selected, as these prevent the making of the cut to receive the scion. The branches should be cut as close to the same height as possible, thus ensuring a more even growth of the grafts—there is a tendency for the highest graft to take too much of the growth. Care should also be taken to make the cut at right-angles to the sides of the branch. Finally, the rough surfaces of the cuts as left by the saw should be shaved over with a sharp knife to smooth them.

The cuts necessary to prepare the stock for the reception of the scion consist of a slit down the side most suited for its insertion and a similar slit exactly opposite. These cuts are best made by taking in the right hand a straight-bladed knife, placing the edge of the blade across the section to be treated in such a position as to take in with the bark about one-sixteenth of an inch of wood, and grasping the stock with the left hand in such a way that the thumb is on the portion to be cut, see-sawing the blade down for about 1½ inches, taking care not to let it work outward, which would of course sever the wood from the stock. In a very dry season the amount of wood taken with the bark on the stock should be very slight, as the sappy area seems to be reduced during a very dry time. The cut is illustrated in Fig. 1.

Preparing the Scion.

Scions for strap grafting should be rather stouter than those selected for ordinary grafting. With a sharp budding knife cut a strip of wood and bark about an inch longer than the width of the stock that is to be grafted. The amount of wood taken with this strip (or strap, as it is called) is about equal to the amount of wood that is left in a bud when budding—that is to say, a very thin strip. If too much wood is left in the strap, it will be found later to crack when it is being turned over into the slit provided in the stock, while if no wood is taken it is inclined to perish, being too thin. The cut made to lift this strap should terminate close to the base of the bud. As there are only two buds on each scion, this will ensure the terminal bud being on the outside of the scion. When it is thought necessary to have the terminal bud on the inside, the strap must be cut on the opposite side of the scion, thus bringing the terminal bud to the inside of the scion when placed in position.

When cutting this strap the scion is held in the thumb and forefinger of the left hand, and the knife in the right hand with the thumb on the opposite side of the scion to act as a gauge and ensure that the same thickness of wood

Fig. 1.

Fig. 2.

Fig. 3.

is taken for the full length. In making this cut the heel of the knife should be slightly in advance of the point, and the blade should be drawn straight along (not with a see-saw motion). When the desired length has been cut the knife is turned sharply up on its edge, thus turning the strap at right-angles to the scion (see Fig. 2).

The scion is now turned over for the cut to to be made on the opposite side. Hold as before, place the thumb on the cut from which the strap has been lifted, and make on the opposite (the upper) side a cut about 1¼ inches in length and taking in about one-third of the total thickness of the scion, terminating this cut exactly opposite the termination of the strap. Now cut the scion off at the bud above which the strap terminates, leaving two buds only. Place the thumb on the side of the scion opposite to the strap, lift the strap at right-angles to the scion (see Fig. 3), place the knife

close into the angle thus formed, and cut out the central piece of wood by rolling the scion between the knife and the thumb. The scion is now two-pronged, suggestive of a very attenuated clothes-peg (see Fig. 4), with a long strap on one side and a short stout tongue on the other. Shave off a very thin strip of bark about half an inch long from the end of the tongue—sufficient just to expose the cambium where the tongue comes in contact with the strip of wood and bark on the stock. It will be noted that in this method of grafting, the cambium of the scion does not come exactly in contact with the cambium of the stock, but with the sap wood just below the cambium.

Inserting and Tying the Scion.

Place the tongue of the scion in the cut prepared for it in the stock (usually on the outside—see Fig. 5), run the strap across the top of the stock, and gently turn it down into the cut on the opposite side of the stock again (Fig. 6). As was the case with the tongue, the slightest shave of bark is taken off the outside of the strap where it turns down into the stock. If the strap is inclined to crack on being bent over, too much wood has been taken with it, and it is then advisable to reduce the angle at which the strap turns over the stock by running the knife across it.

To bind the scion into position, take about 2 feet 9 inches of binder twine, and, leaving the odd 9 inches spare, start to wrap from the top of the stock. When three or four turns have been taken round the

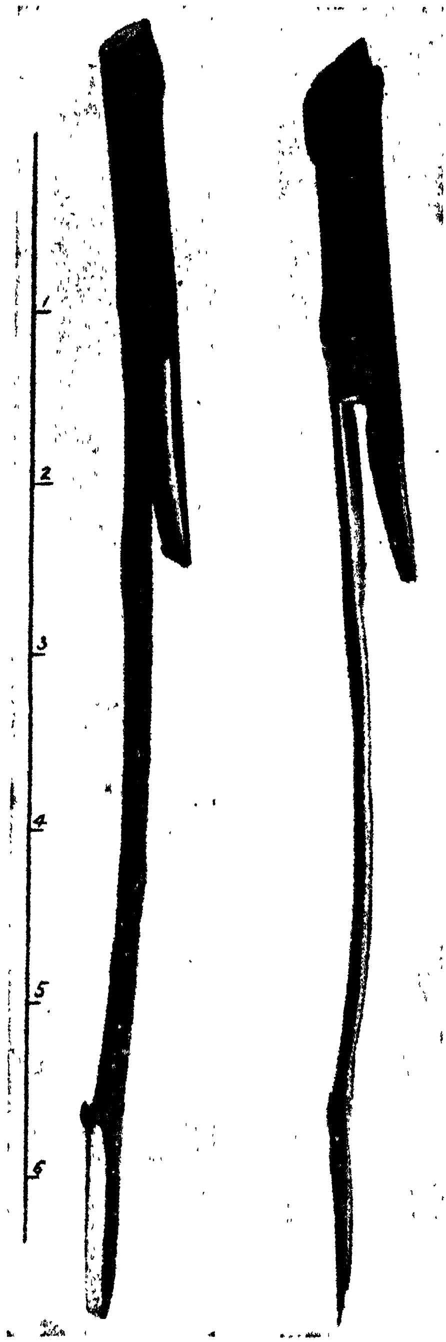


Fig. 4.

stock bring the loose end up over the top, crossing the strap close to its junction with the scion, pull firmly down, and secure by taking a few more turns round the stock. Now take the loose end up over the strap again, securing it in the same way, and continue the process of binding until the cuts are firmly secured for their full length—see Fig. 7 (A).

Fig. 5.

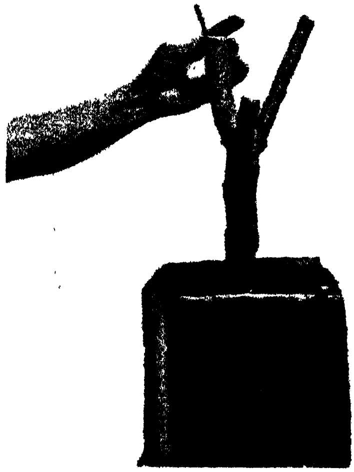


Fig. 6.

Fig. 7.

Fig. 8.

Covering for the Grafts.

It is now necessary to cover the grafts with some air-tight covering. The method usually adopted in strap grafting was to cover with clay, but good clay is not always easy to obtain and is very severe on the hands of the user. Grafting wax is effective but is sometimes troublesome to make and very sticky when in use, and if the whole job is done by the one person it is inclined to make the hands troublesome for the other operations. Some time ago the writer saw putty used for this work by Mr. J. Chick, of Tenterfield, 98 per cent. of the grafts being successful. Since that time he has used this covering and has found it to have many advantages.

Fig. 9.

The putty is prepared from draught castor oil and best English whiting; sufficient to cover about seventy grafts on, say, seven year old apples would take 8 lb. of whiting and a pint and a half of oil. It should be mixed rather on the dry side several days before it is used, and placed in a can of water, which makes it more plastic, and in which it can be kept for any length of time. Putty can be specially recommended where trees have been attacked

with woolly aphis—the aphis will not attack cuts so covered. Putty can be made with linseed oil, but draught castor oil is better, as the putty thus made remains soft for a longer time and does not set so hard.

A fairly thick coating of putty is placed over the whole of the work, and worked down over the tie all around the stock so that all cuts are completely covered. The fingers should be dipped in water and the whole smoothed over, and the putty worked well around the base of the scion. Finally, cover the putty with strips of old cloth or paper (see Fig. 8—graft covered with putty at A, and covered with cloth at B).

Fig. 10.

Treatment of Small Branches.

Branches up to 1¼ inches in diameter are not cut off at right-angles, but with a slanting cut—see Fig. 7 (B). The sharp angle resulting is then sliced off with a knife, making a flat surface at the top for the scion to sit on; and this cut should be made so as to have the top of the stock exactly fitting the angle cut in the scion. The preparation of the scion and the cuts in the stock are exactly the same as in the first operation.

Grafting is best done before there is any sign of growth, especially in the case of apples and cherries.

When the grafts begin to shoot all young growth arising from the cut-back branches should be kept shortened back but not rubbed off, as the few leaves thus made help to keep the sap in circulation.

Fig. 9 shows the grafts just beginning to shoot. Fig. 10 shows grafts 3 years old., in which the cut is completely covered.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Wheat—

Bena	E. J. Johnson, Iona, Wongalea. J. Lyne, Downsfield, Yenda. W. Ash, Old Grenfell Road, Forbes. S. Kanaley, Junee. J. W. Wilson, Collie Road, Gilgandra.
Binya	Manager, Experiment Farm, Condobolin.
Canberra	Manager, Experiment Farm, Trangie. W. W. Watson, Woodbine, Tichborne. Quirk and Everett, Narrawa, Wellington. T. Jones, Birdwood, Forbes. E. J. Johnson, Iona, Wongalea. E. J. Allen, Gregra. B. J. Stocks, Linden Hills, Cunningar Cullen Bros., Bunglegumbie, Dubbo. D. L. Miller, Glen Lossie, Daroobalgie. Manager, Experiment Farm, Condobolin.
Clarendon	E. J. Johnson, Iona, Wongalea. J. W. Wilson, Collie Road, Gilgandra. Manager, Experiment Farm, Coonamble.
Cleveland	W. Burns, Goongirwarrie, Carcoar.
Currawa	W. Cameron, Heather Brae, Loomberah. Quirk and Everett, Narrawa, Wellington.
Federation	W. W. Watson, Woodbine, Tichborne. E. J. Johnson, Iona, Wongalea. J. Lyne, Downsfield, Yenda. T. Jones, Birdwood, Forbes. D. L. Miller, Glen Lossie, Daroobalgie.
Firbank	Manager, Experiment Farm, Condobolin. Manager, Experiment Farm, Trangie.
Florence	Manager, Experiment Farm, Coonamble.
Gresley...	E. J. Johnson, Iona, Wongalea. W. W Watson, Woodbine, Tichborne. J. W. Wilson, Collie Road, Gilgandra D. L. Miller, Glen Lossie, Daroobalgie. Manager, Experiment Farm, Condobolin.
Hard Federation	Manager, Experiment Farm, Temora. Manager, Experiment Farm, Trangie. B. J. Stocks, Linden Hills, Cunningar.

PURE SEED—*continued.*

Wheat—continued.	
Marshall's No. 3	**B. J. Stocks, Linden Hills, Cunningar.**
Penny	**B. J. Stocks, Linden Hills, Cunningar**
Riverina	**Quirk and Everett, Narrawa, Wellington** **Cullen Bros., Bunglegumbie, Dubbo.**
Turvey	**Quirk and Everett, Narrawa, Wellington** **D. Bolte, West Wyalong.**
Wandilla	**G. R. B. Williams, Gerelgambeth Ltd., Illabo.** **Manager, Experiment Farm, Temora.**
Waratah	**Manager, Experiment Farm, Trangie.** **W. W. Watson, Woodbine, Tichborne.** **E. J. Allen, Gregra.** **Quirk and Everett, Narrawa, Wellington.** **G. R. B. Williams, Gerelgambeth Ltd., Illabo.** **J. W. Wilson, Collie Road, Gilgandra.**
Yandilla King	**Quirk and Everett, Narrawa, Wellington.** **B. J. Stocks, Linden Hills, Cunningar.** **Cullen Bros., Bunglegumbie, Dubbo.** **S. Kansley, Junee.** **Manager, Experiment Farm, Temora.** **D. L. Miller, Glen Lossie, Daroobalgie.**
Oats—	
Algerian	**C. Bennett, Forbes-road, Cowra** **D. B. Milthorpe, "Somerset," Narandera.**
Gidgee	**Manager, Experiment Farm, Trangie.**
Mulga	**C. Bennett, Forbes-road, Cowra.** **Manager, Experiment Farm, Condobolin.**
Barley—	
Trabut	**J. W. Childs, Camden.**
Field Peas—	
French Grey	**Principal, H.A. College, Richmond.**
Lima	**Principal, H.A. College, Richmond.**

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

THE ADVANTAGES OF HERD TESTING.

THE advantages of the herd-testing work are briefly as follows:—

1. It individualises each cow, and is the only method of estimating the producing ability of each member of he herd.
2. It tests systems of feeding for milk production.
3. It tests the herd sire through the production of his daughters.
4. It creates higher values for proved cows and their progeny.
5. It shows positively that some system of milk recording and testing is essential to progress.
6. It will direct attention to loss through faulty separating. During last year a dairyman with a large herd discovered a loss of 15s a day by the herd tester chancing to test the skim milk
7. Herd-testing Association meetings can be utilised as a means of bringing district dairymen together, when local and general problems can be discussed.

—W. J YUILL, Senior Dairy Supervisor, Victoria.

Poultry Notes.

April.

JAMES HADLINGTON, Poultry Expert.

In order to prevent the mistakes most commonly made in the early preparatory work for the breeding season, some indication was given in last month's notes as to what to avoid in the selection or purchase of breeding stock. It is now proposed to deal with the general run of birds to be selected—the hens and pullets—as breeders.

Poultry-farmers who have five years and upwards of experience will have, for the most part, formed their own ideas in this regard. It does not, however, follow that such ideas are always sufficiently sound for the novice to follow them in their entirety, and it is a peculiar fact that wrong ideas appear to have a greater attraction for the beginner than those based on more mature experience; hence it is that one sees many lamentable mistakes made at some cost to the poultry-farmer, whatever the measure of success. For instance, one farmer will believe in using only second and third year hens as breeders, while another will rely almost entirely on pullets. Again, one will believe in selecting only late moulters, while another will have nothing to do with them.

For all these ideas there is a modicum of justification, but one should beware of carrying them to extremes. The farmer who has had favourable results in using pullets as breeders is one that has been careful to make good selections of well grown and mature specimens, while the one who condemns pullets as breeders has used poor, undeveloped specimens, and has in consequence had a crop of miserably small chickens, lacking in constitution, and has experienced undue losses in rearing. But this was not the result of using pullets as breeders, but because of the class of pullet selected, or more likely because no selection was made at all. Such a farmer is likely to become a convert to the 2 or 3 year-old-hen idea and to excluding pullets from the breeding pens altogether.

Having adopted this idea, aged hens become his only source from which to draw his breeders. His next trouble is that when the time for starting to incubate eggs arrives, say, June or July, but comparatively few eggs are laid, and though he is impatient to get eggs down, he cannot hurry the old hens. The end of the hatching season is soon in sight, too few chickens are hatched, and this farmer then finds himself in the position of having his biggest batches of chickens late hatched and almost valueless for the purpose of carrying on the farm.

Then there is another idea—breeding from late moulters because they are the best layers. It can be taken as true that the late moulter is a better layer than the hen that moults early: this follows as a matter of course, because she has had a longer period of laying. The reasoning of the devotee of this idea is that the use of such hens in the breeding pens

ensures that only good layers are being bred from. But here again extremes are equally as bad as in the previous cases. If the farmer holding extreme ideas on this subject is wise, he will learn from his first experience, but unfortunately there are those who repeat their mistakes, and while practising them, advocate the same practice among their neighbours, who are perhaps unsophisticated enough to treat this advice as coming from a practical farmer.

The best practice lies between all these extremes, and the farmer who makes it a rule to use half hens and half well-grown and fairly well matured pullets, and includes such late moulting hens as are not too late in moulting, will be adopting sound principles as far as age is concerned. With regard to the late moulters, it is no use expecting hens that have not finished their moult by the end of May to be much use as breeders before August, and even then such hens are scarcely the class of stock to produce strong chickens. A good criterion, however, is the class of egg being laid: one should observe the strength of shell and quality of the contents of the eggs. If, for instance, the shells are poor, the albumen lacks density, and the yolks are poor and spotted, it can be taken as a sign of exhaustion, brought about most likely by the laying of an abnormal number of eggs, or ill-health from some other cause. Such eggs are not fit for setting, and they can only lead to degeneracy in the chickens hatched.

Breeding from Pullets.

With regard to breeding from pullets, *i.e.*, females under twelve months old, if these are well developed and ten months old, there is no reason why they should not be bred from, and there is this great advantage that they will usually be in full lay a month or six weeks before hens which are in their second year. Therefore, it is to such pullets that the farmer must look to produce early chicks, *i.e.*, it is the early-hatched pullets of each season that must be looked to to produce early stock the following year.

But these pullets, particularly in the light breeds, such as Leghorns, come on to lay usually about December, lay for a couple or three months, and then go into a partial moult, which usually takes about three weeks to get through. There is often some prejudice against these pullets on this account, but it should be remembered that the effect of this partial moult is to constitute them more mature and better fitted for the breeding pen than are pullets that have not moulted. Usually these pullets lay eggs of full size and of good quality—just what are needed for incubation.

Make Up the Pens.

Whatever the mating, it is not too early now to get the hens and pullets into the breeding pen, having in mind that the breeding pens should be made up by 1st May. It is, of course, not necessary to put the male birds in until about two weeks before eggs are required to be saved for hatching, and as far as flock matings are concerned, it is scarcely advisable to put the male birds in earlier, because there is almost sure to be quarrelling among them, and the earlier they are penned the more losses are likely.

Flock Matings.

In connection with flock matings it is as well to remember that whatever the number mated in the first place, it scarcely ever happens that all carry through the season; on the other hand, replacements of males or reduction of females are almost invariably necessary. This is one of the drawbacks incidental to flock mating.

The first trouble likely to be experienced is that one or more of the male birds becomes beaten by the others. If this occurs by way of fighting the trouble is at once apparent, but even in this case the farmer is likely to look upon the matter as settled, and take no further notice when the fighting stops. He mostly fails to notice that the battle has ended with one or more of the combatants being so beaten as to cause them to cower to the others. Such birds at once become useless in the pen. Often this trouble is of an insidious nature, and instead of a knock-out battle between the birds, one or more cower to the others so as to be kept away from food by the bullies, and in this way very soon become emaciated and useless. If this condition is not detected while there is time to remedy it, if possible, by special feeding, the results will not be found until during incubation—when infertility and weak chickens will be manifest. How then is one to maintain effective flock matings? The answer is: by the exercise of vigilance in the first place as to what is really occurring in the pens, and applying the remedy by rearrangements to meet the requirements of the particular case. If, for instance, one or more of the male birds have become useless, either through fighting or cowering, they should be taken out of the pen. The difficulty, however, is that it is rarely possible to replace a bird or birds as long as others are left in the yard without risking the whole trouble all over again. In such a case there are only two courses open, either to replace the whole of the male birds, or to reduce the number of hens to suit the number of males left in the yard.

In using this class of mating, one should, if possible, use male birds that have been reared in the same yard. Even then they will often become quarrelsome after being mated, but they are much less likely to do so than birds from different yards; in fact it is rarely that successful matings can be secured in that way.

Size of Flock Matings.

As many as one hundred hens with eight or ten male birds can be run successfully, and as a matter of fact, usually with more success than, say, half that number of hens with the proportionate number of male birds. Flock matings with two males and, say, twenty females are but rarely successful; three males to thirty females is better, but as a rule less successful than higher numbers. It should be borne in mind that it is always advisable to put in an extra one or two male birds over the required number to allow for some being knocked out in the early stages of the mating.

As to the merits of the system of flock mating, much of course, depends upon the care exercised in the selection of the units comprising the flock. But at best it is a crude and unscientific method of breeding, and at its worst it is one of the biggest factors in pulling down all that careful and scientific stud breeders have built up. In too many cases flock matings are made up of all sorts and sizes of birds, and contain many that should never be bred from at all.

Flock matings are, however, almost inseparable from the wholesale production of cheap chickens to sell as day-olds. Such matings have therefore become part and parcel of present-day methods of poultry breeding, and the system will no doubt continue despite all that might be urged against it. The best that can be hoped is that farmers will exercise more care in selection for such matings, and thus minimise their degenerating influence upon the poultry industry.

Control of Thrips.

The serious and widespread cases of thrips infestation in our fruitgrowing districts last season make the life history of this pest a matter of importance to the orchardist. Thrips lay their eggs in the leaf and flower stems, and develop first as minute yellow, wingless, immature insects; in a few week's time they reach the adult winged stage, when they possess four minute wings fringed with long hairs. The mouth parts consist of minute pointed styles with which they both pierce and break the epidermal cells and destroy the surface tissue upon which they feed. In both immature and adult stages they feed on the tender surface tissue of styles, anthers, filaments, and the petals of the blossoms, and to a lesser extent on leaf tissue. Under dry conditions the adults live for weeks. They reproduce and increase to enormous numbers, and there may be several generations.

These favourable conditions pertained from midwinter to midsummer during the past season, and thrips were prevalent on weeds, native shrubs, and garden plants as well as fruit trees from early spring. The damage may weaken the whole blossom, and sometimes kills it before it opens, or weakens or destroys the styles, anthers, and filaments, as well as the petals. The blossoms are sometimes weakened, and even destroyed by the thrips before they are fully open.

Control measures may be summarised as follows:—

1. Clean cultivation during mid and late winter to eliminate weed growth which may be harbouring the thrips, especially during a mild winter.

2. Spray early with a spray made up of 12 fluid ounces nicotine sulphate to 60 gallons of water, to which is added 1 gallon miscible red oil—first, at spur-bursting stage or when the bud clusters are separating, and again at early pinking stage before the petals have begun to unfold. Thoroughly applied, the above spray should give adequate control.

If the early sprays are neglected and thrips occur in the opening or open blossoms, spraying should be made with nicotine sulphate, 1 part in 75 gallons of water, plus 1¼ lb. soap.—W. B. Gurney, Government Entomologist.

Orchard Notes.

APRIL.

W. J. ALLEN and H. BROADFOOT.

HARVESTING is still in progress with late varieties of apples and pears, and growers would be well advised to see that the picking of the fruit is carried out in a careful manner. It very often happens that a grower who is careful with his cultural work—pruning, spraying, &c.—is not so careful when picking fruit. This is mainly due to the fact that he does not realise how important it is to keep the skin of the fruit in a sound condition.

Avoid Bruising when Picking or Packing.

When fruit is injured by dropping it carelessly into the picking bags, pouring it roughly into picking boxes, and carting it over rough tracks, the keeping qualities of the fruit are adversely affected. Careful handling of fruit is of paramount importance, as fruit, to arrive on the market in a sound condition, must be picked and packed with care.

It is quite a common occurrence to see fruit arriving on the market badly bruised, due to carelessness in picking, or to packing the fruit too high or too loose. If packed loose the fruit is badly bumped about during transit, while, if packed too high, it is badly bruised when the lid is being nailed on the case.

Packing for Local and Export Markets.

When apples are being packed for the local market it is advisable to wrap the fruit, particularly the best grades. The wrap should be finished over the stalk so as to prevent stalk injury, and each specimen should be placed firmly in position, the cases being packed "full."

When fruit is being packed for export, a slight bulge on top and bottom of the cases is desirable. This allows for shrinkage during transit. To get the bulge, only cases with flexible tops and bottoms should be used.

Fruit Cases.

Many growers who buy timber in shooks and make the cases do not use nails of sufficient length or gauge, and consequently the nails draw out under the slightest pressure, causing a board or side of the case to fall away, and resulting in the spilling and damaging of the contents.

The length and gauge of nail to use will depend on the class of timber which is being used in the making of the cases. After the cases are wired there is no danger of the boards becoming loose or falling away, but this often happens while the cases are being handled before wiring. When growers are using cleats, there is often a tendency for them to split, and to avoid this the cleats should be soaked in water before being used.

Codling Moth.

The most important phase in connection with moth control this month is the destruction of infested fruit. It must be borne in mind that it is the carry-over grubs which start next season's infestation, and growers should do all in their power to minimise the number of carry-over grubs. All infested fruit should be destroyed by boiling or burning. This work, to be effective, must be carried out at short intervals, and the fruit destroyed whilst it is infested. If the grubs are allowed to leave the fruit there is a danger of some of them getting into some sheltered position, where they will winter over unnoticed, even though a most diligent search has been made by the grower with the object of destroying as many as possible.

Woolly Aphis.

When trees are badly infested with aphis they should be given a good spraying with tobacco wash or nicotine extract as soon as the fruit has been picked It is necessary when spraying for this pest to use plenty of force, and the nozzle should be held close to the infested parts so as to dislodge the aphis. To apply nicotine extract in the form of a mist for control of this pest is time and money wasted.

Prepare for the Citrus Harvest.

The harvesting of early varieties of citrus fruits, grown in the early districts, will commence next month, and growers would be well advised to have everything in readiness for handling the fruit. If not already done, the picking boxes should be thoroughly overhauled and cleaned, and any loose boards on the cases should be securely fastened and protruding nails removed. To secure the best results, it is necessary to keep the skin of the orange in a sound condition—free from abrasions or punctures.

When sizing machines are used, they should be thoroughly examined, and any necessary adjusments made. The advent of sizing machines has done much to assist the grower, and those growers who have not yet installed a sizing machine in their packing shed should do so as soon as possible. Hand sizing is certainly a slow, costly, and not altogether accurate way of carrying out the work. Sizing by machines is far more accurate, considerably quicker, and much more economical.

Fumigation.

Fumigation may be continued during April, but growers would be well advised, if they desire that the fruit should be free of red scale by the time it is ready for market, to complete the work as soon as possible. The completion of the work at an early date is also desirable if white wax is present.

It is necessary, in order to obtain the best results, to see that the sheets or tents are free from holes, to measure all trees accurately, and apply the dosage corresponding with the measurement. Failures and poor results are generally the outcome of carelessness and guesswork.

Planting Citrus Trees.

Citrus trees may be planted in localities where autumnal frosts are unknown. When trees are being moved from the nursery to the orchard care should be taken to prevent the roots from drying out. They should not be exposed to the sun or wind.

All poorly developed trees should be unhesitatingly rejected. Only healthy, robust trees of known good strain with a good root system should be planted. Before planting out, remove all broken or damaged roots, and make a puddle in which to dip the roots prior to planting. The trees must be planted the same depth as they grew in the nursery.

Farmers' Pure Seed Areas.

THE following additional yields were obtained on pure seed plots conducted during 1926 by branches of the Agricultural Bureau in the western district (Dubbo centre) in association with the Department, a report on which appeared in the *Agricultural Gazette* last month:—Terramungamine: Waratah, 21 bus. per acre; Hard Federation, 21 bus.; Clarendon, 18 bus.; Yandilla King, 18 bus. Narromine: Federation, 33 bus. per acre; Gresley, 30 bus.; Canberra, 18 bus. Backwater: (Wheat), Clarendon, 22 bus. per acre; Bena, 20 bus.; Binya, 16 bus.; (Oats), Mulga, 32 bus.; Sunrise, 21 bus.; Guyra failed (sown too late).—B. M. ARTHUR, Senior Agricultural Instructor.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1927.

Society and Secretary.	Date.	
Liverpool (R. C. Fitzpatrick)	April	22, 23
Dorrigo (J. H. Skeoch)	,,	27, 28
Gloucester	,,	27, 28
Narrabri	,,	27, 28
Bathurst (N. B. Richardson)		27, 28, 29
Forster (W. Poppenhagen)	,,	29, 30
Wellington (A. E. Rotton)	May	3, 4
Wingham (D. Stewart)	,,	4, 5
Grafton (L. C. Lawson)	,,	4, 5, 6, 7
Windsor (R. B. Tate)	,,	5, 6, 7
Dubbo	,,	10, 11
Maclean (T. B. Notley)	,,	11, 12
Warialda	,,	11, 12
Dungog (W. H. Green)	,,	11, 12, 13
Coonamble (J. C. Wilson)	,,	18, 19
Narromine	,,	18, 19
Ulmarra	,,	18, 19
East Gresford (C. K. Holden)	,,	20, 21
Casino (P. W. W. Manson)	,,	24, 25, 26
Trangie (A. K. Butter)	,,	26, 27
Warren (R. H. Armstrong)	June	1, 2
Bonalbo (W. G. E. Johnston)	,,	8, 9
Peak Hill (T. Jackson)	July	26, 27
Tullamore (J. M. Robertson)	Aug.	3, 4
Trundle (W. A. Long)	,,	9, 10
Condobolin (J. M. Cooney)	,,	16, 17
Illabo	,,	17
Wagga Wagga (F. H. Croaker)	Aug.	23, 24, 25
Bogan Gate (J. Egan)	,,	24
Parkes (L. S. Seaborn)	,,	30, 31
Cootamundra	,,	30, 31
Grenfell	,,	30, 31
Lake Cargelligo	,,	31
Young	Sept.	6, 7, 8
Gunnedah (M. C. Tweedie)	,,	6, 7, 8
Forbes (E. A. Austen)	,,	6, 7
Ungarie	,,	7
Ganmain (C. C. Henderson)	,,	13, 14
West Wyalong	,,	13, 14
Cowra	,,	13, 14
Albury (A. G. Young)	,,	13, 14, 15
Murrumburrah	,,	20, 21
Canowindra	,,	20, 21
Temora	,,	20, 21, 22
Boorowa	,,	22, 23
Barellan	,,	28
Barmedman	,,	28
Hillston	,,	30
Ardlethan	Oct.	5
Quandialla	,,	5
Narrandera (M. F. Murray)	,,	11, 12
Ariah Park	,,	12
Griffith	,,	18, 19

Agricultural Gazette of New South Wales.

The Better Farming Train.

TO VISIT THE NORTH COAST.

THE Better Farming Train is being refitted in Sydney at the present time, and will commence its tour of the North Coast district on 16th May. According to present arrangements the train will visit the following centres on the dates indicated during the first three weeks of this tour:—

Maitland, May 17, 18.	Taree, May 23, 24.	Raleigh, May 31.
Dungog, May 19.	Wauchope, May 25.	Coff's Harbour, June 1.
Gloucester, May 20.	Kempsey, May 26, 27.	Glenreagh, June 2.
Wingham, May 21.	Macksville, May 28-30.	South Grafton, June 3.

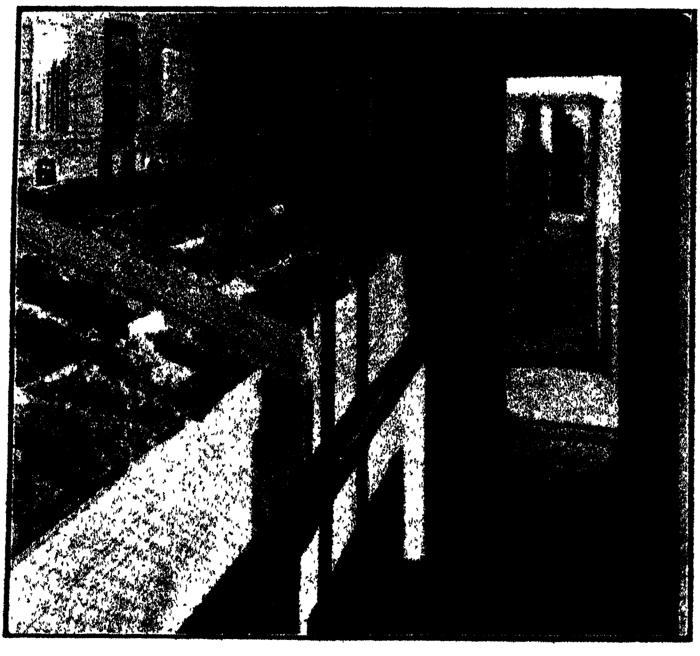
The train will then proceed to Grafton and remain there for a fortnight before continuing its northern tour. While in the depot at Grafton it will not be open to the public, but the first two days of the next itinerary will be devoted to work at this centre, when all sections will be open for inspection, and the staff will be in attendance to conduct demonstrations and lectures, as well as to give advice by personal interview. Full particulars can be obtained from station-masters, public schools, or any officer of the Department of Agriculture.

Many new features are being included in the make-up of the Better Farming Train for its work in coastal districts, particularly in the sections devoted to dairying and pasture improvement, the object being to deal mainly with the branches of primary production which most concern the people who will visit the train in those areas.

Every effort will be made to suit the requirements of the district and the convenience of farmers by arranging the programme of lectures and demonstrations for times that will not interfere unduly with work on the farm. Those who cannot leave their holdings to attend demonstrations at any particular time should bear in mind, however, that the train staff is in attendance throughout the day to discuss matters of interest and to afford information. The exhibits in the various sections in themselves convey a wealth of information on all branches of agriculture.

On its first tour the Better Farming Train visited southern districts, and at the nine centres included in the itinerary, 32,000 people passed through the cars and attended lectures and demonstrations in the marquee, in addition to the many who were present at the lantern lectures given nightly in the open air. On that tour expressions of regret were heard on all sides that the train could not remain longer at each town, and many who were unable to obtain all the information they desired in the time allotted followed the train to the next stopping place.

The Opening of the Better Farming Train.
The Hon. W. F. Dunn speaking at Harden.



Portion of the Wool Exhibit.

Mr. A. H. E. McDonald (the Director of the train) urges everyone to "Come early and stay all day." The hot water service provided for the convenience of visitors who lunched at the train was freely availed of on the first tour, and will again be a feature at each stopping place on the North Coast.

In the Agrostologist's Section.

The feature at the end of the Exhibit with the prominent white signs is a collection of Weeds growing in pots.

The complete make-up of the train is now as follows:—

Veterinary Science.	Publications.
Agriculture.	Irrigation.
Dairying.	Rural Bank.
Live Stock.	Co-operative Organisation.
Grasses and Weeds.	Health.
Plant Diseases.	Women's Sections—
Fruit.	Cookery.
Insects.	Needlecraft.
Sheep and Wool.	Baby Welfare.
Poultry.	Rural Homes Improvement.

The equipment of the train includes a cinematograph, which is used to show interesting and instructive films at night, and also for the lantern lectures which have proved so popular.

Branches of the Agricultural Bureau and other producers' organisations should specially note the dates upon which the train will visit the centres most convenient to their members, and organise parties to spend a day at

"the travelling university." The Railway Commissioners provide facilities so that those who have to travel by rail to see the train may be able to obtain tickets at reduced fares.

In some cases the inquiries addressed to officers of the Department have involved visits to private farms; the members of the staff have always been glad to be available in this way if the circumstances have permitted, and if conveyances are provided.

There is no charge for admission to the Better Farming Train. It is free to all, and special efforts are being made to cope with the great number of visitors who are expected during the North Coast tour.

Up-to-date Utensils figure prominently in the Dairy Car.

What the Newspapers are Saying about the Train.

A big mission.—*Wagga Express.*

Gathering friends wherever it goes.—*Wagga Advertiser.*

The farmers recognise it as a combined movement intended for their good.—*Daily Telegraph.*

The most fascinating thing of its kind ever witnessed.—*Cootamundra Liberal.*

Doing splendid work.—*Junee Southern Cross.*

Attracting thousands of visitors.—*Sydney Morning Herald.*

The women's sections have befriended the farmers' wives and daughters.—*Wagga Advertiser.*

Intensive educational campaign.—*Daily Telegraph.*

A wonderful instrument for the education of those farmers who are prepared to learn.—*Albury Border Morning Mail.*

In the Lecture Tent.

The Limitations of Silage.

While the quantity of any suitable fodder stored is the first consideration in judging a fodder conservation competition, it is necessary to stress the importance of providing a balance ration, or (in other words) a variety of fodders, which will be relished by the stock and maintain their condition. Silage conserved in pits is the most economical method of storage, as there is practically no waste, deterioration, or loss by fire, mice, &c. But silage fed to stock only supplies the carbohydrate requirements of a ration, and other fodders, such as grain concentrates, or roughage such as lucerne hay or cereal hay, are required to provide the necessary proteins.—B. M. Arthur, Senior Agricultural Instructor.

The Value of Oats

There is no better crop than oats for growing in rotation with wheat: it is not subject to attack by "flag-smut" or "take-all," and if a year of bare fallows follows before the wheat crop is sown, the fungus spores are given an opportunity to germinate, and to perish in the absence of a host. Moreover, oats can be grown successfully throughout the wheat areas; even in the drier districts the newer early-maturing varieties will succeed. The crop can be used for many purposes, though it would soon cease to be profitable if large areas were sown for the sole purpose of producing oats for market.

The grain is one of the best concentrated feeds for stock, and is capable of being stored as an excellent reserve against drought; it is also most valuable as a hay or a green fodder crop. It is advisable always to use oaten hay for the feeding of farm horses, as a safeguard against the re-infection of fallows by the use of wheaten hay that may contain "flag smut" spores.

An early-maturing oat, such as Mulga, provides an excellent winter fodder crop on which to graze sheep, and is of special value to lambing ewes and for fattening lambs for market. The crop can also be conserved in the form of silage.—H. C. Stening, Chief Instructor in Agriculture, at Grenfell Bureau Conference.

WINTER SCHOOLS FOR FARMERS, 1927.

ARRANGEMENTS have been made for the annual Winter School for Farmers to be held at the Hawkesbury Agricultural College from 28th June to 22nd July next. The syllabus covers a comprehensive course of lectures and demonstrations on agriculture, horticulture, live stock, &c., and, in addition, practical training is available in useful work connected with farm life, such as saddlery, engineering, blacksmithing, carpentry, &c.

To meet a popular demand, a special school will be held for those who desire to specialise in the subject of poultry-farming. All branches of the industry will be fully dealt with, and, moreover, the students will be given an opportunity of studying such subjects in the general course as are likely to be of value to them.

Farmers and youths over 16 years of age who have been engaged in rural work for at least one year will be eligible for admission to the general course, and admission to the poultry course will be granted to persons of either sex over the age named who are engaged in poultry-farming.

Applications for both schools should be forwarded immediately.

The fee for either course, inclusive of board and lodging, will be £5 5s. Prospectus and full information may be obtained on application to the Under-Secretary, Department of Agriculture, Sydney.

"WEEDS OF NEW ZEALAND."

"WEEDS occupy the place of valuable crops or pastures on the farm, and the first step toward their eradication is their identification."

With this as a sort of text, Dr. Hilgendorf, of Lincoln Agricultural College, Canterbury, New Zealand, has marshalled within the compass of a handy little volume a great deal of information that hitherto has been scattered through official and private publications and note-books in the Dominion. It is hoped that by making this material more available, farmers will become more vigorous in their campaign against the intruders and that students will be better and more effectively informed.

The greater part of the book is occupied with brief notes upon common weeds, grouped according to families, but named by their common names. A general discussion on the subject of weeds, a statement of the principles of weed control and other matters, with a good index, comprise a volume which also contains many illustrations of a kind that will help Dominion farmers in identification.

Published by Whitcombe and Tombs, Limited. Our copy from Angus and Robertson, Sydney.

PROTECT PIT SILAGE PROPERLY.

SILAGE pits are generally fairly safe, but a good crown is necessary to turn off surface water. This can be secured by seeing that the green stuff is built so high above ground level when the pit is being filled that when settling has ceased, it has not gone below that level. Otherwise an unnecessary amount of earth is required to cover the material and prevent water soakage. —B. M. ARTHUR, Senior Agricultural Instructor.

Fodder Conservation for Wheat and Sheep Farmers.

E. S. CLAYTON, H.D.A., Senior Agricultural Instructor.*

DURING the last few years greater interest than hitherto has been taken in the conservation of fodder. The number of sheep carried in New South Wales has now reached a high figure, and most properties are rather fully stocked. Graziers and mixed farmers seem to be turning from the old time risky dependence on the favours of the season to the safer and more scientific system of conserving fodder for use in the inevitable drought periods that we experience.

The fodder conservation competitions conducted by the Wagga, Cootamundra, and Narromine Agricultural Societies, and the interest taken by the Royal Agricultural Society, have stimulated a great deal of interest in this matter, and by focussing attention on the methods of the most experienced conservers of fodder in the State, have proved of great practical value.

Comparing the various methods of conserving fodder, we find many points of absorbing interest. We have in the past thought very highly of sheaved hay in stacks, but when this method is compared with some of the other systems, its drawbacks, as far as conservation for drought is concerned, become very evident. It is indeed rare that a haystack can be made mouse-proof and kept so. Even when it is built on a good mouse-proof stand, constant vigilance is needed to keep mice out. Mice gain access in many ways—straws pulled out by birds and falling against the stack will enable them to gain entrance. Stacks are also liable to be affected by the weather, and must be insured against fire. Another point is that under practical conditions the fodder may have to be stored for five or even ten years before it is needed, and for this purpose hay is not so suitable as the other forms. Hay, if kept in stacks for any great time in our dry climate, becomes very dry and brittle, and is difficult and wasteful to handle. Experienced men now consider that the three best forms of conserved fodder in sheep and wheat districts are:—

(1) Silage in pits;

(2) Grain (oats or maize) stored in galvanised-iron silos or mouse-proof sheds;

(3) Hay (lucerne, oaten, and wheaten) pressed into bales of 80 or 90 lb. weight and stacked in a shed or covered with galvanised iron.

Of course, it is very necessary to have sheaved hay in stacks for farm horses, but that is quite a different matter from conservation for drought periods. No one can deny the value of stacked hay for stock in drought

* Paper read at the Agricultural Bureau Conference at Grenfell, March, 1927.

time, but anyone commencing to make provision for dry times would do better to concentrate on one or two of the three methods suggested. Hay is great feed, but it is better in the form of pressed bales than stacked up in sheaves.

Consider the ideal position of the man who has sufficient pit silage and oats stored in silos for his stock. The two feeds can be used in conjunction with excellent results. Oats also combine well with any kind of hay. These forms of conserved fodder should recommend themselves to the wheat and sheep farmer as they can be easily produced on the farm.

Pit Silage.

For making pit silage, oats and wheat are excellent, and in favourable seasons the natural growth of grasses and herbage may be utilised. Crowfoot in some seasons makes heavy growth, which can be made into silage, and even variegated thistle is sometimes used. So much has already been written on the making of pit silage that it need not be explained in detail here. Pamphlets on the subject are available. A few points, however, are worth emphasising. The pits should not be made too deep; 6 feet is found to be a very suitable depth. A handy size for a pit is 80 feet long, 14 feet wide, and 6 feet deep; this will hold a little over 100 tons of silage if filled correctly. When finally filling the pit up after settling, it is advisable to build it up to a height of 6 feet in the centre and slope it off to the sides, as where the greatest depth exists there the greatest settling will occur. If this is done, when the silage has thoroughly settled the top will be 2 to 3 feet above the ground level and will be nicely sloped towards the ends and sides. About 12 to 18 inches of clay is sufficient covering of earth, but if loam is used a depth of 2 feet is preferable.

Oat Silos.

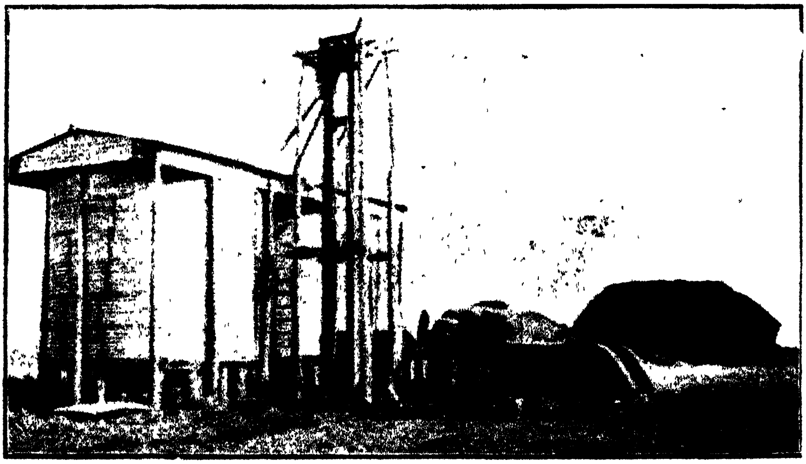
The storage of oats in galvanised-iron silos is becoming most popular; quite a number of such silos are in use around Barellan and Binya, and they are giving great satisfaction. Most of these silos hold about 550 bags of oats, and they are usually erected in pairs, so that 1,100 bags of grain can be stored. Mr. George Bandy, of Oakley Park, Binya, was one of the first to erect silos in this district. He has two silos standing together and a gable roof covering both. They are erected on a wooden platform 3 feet off the ground, are 12 feet high and 14½ feet in diameter. The total cost of erection, including the silos, stand, roof, and labour, was £120. The bottoms of the silos are soldered, and all other joints are rendered watertight by means of screw bolts and packing soaked in special paint. The silos were built on the farm by local plumbers. Each silo is fitted with a sliding door taken from the grain box of an old harvester, and they are excellent for the purpose. It is advisable to put two such doors in each silo, one on each side, so that the silo can be almost completely emptied before it is necessary to get inside and shovel the oats to the door. The doors being fitted with bag hooks and being 3 feet above ground, emptying is an easy operation. With the elevator that Mr. Bandy has attached to his silos he can fill one (550

bags) in a day with ease. These silos are of 22-gauge iron, and are quite strong enough to hold wheat. The Binya farmers who have these silos are very enthusiastic about them. They claim they are most convenient for:—

(1) Storing the oats for their work horses;
(2) Storing oats for sheep, &c., for drought periods; and
(3) Storing oats even for a few months until the price rises, as it invariably does towards winter.

From a financial point of view oat silos are a good proposition. Taking the total cost as £160 (£120 for two silos and £40 for elevator), 7 per cent. would represent an interest charge of £11 10s. per annum, for, say, 3,300 bushels, which is a little less than one penny a bushel a year for storage.

Among others in the south-western district who have given this matter of storing oats for sheep feed some consideration is Mr. J. T. A. Fitzpatrick, of Erin Vale, Junee. Mr. Fitzpatrick has erected two large galvanised-iron



A Pair of Farm Silos for Grain.
On the Farm of Mr. G. Bandy, "Oakley Park," Binya.

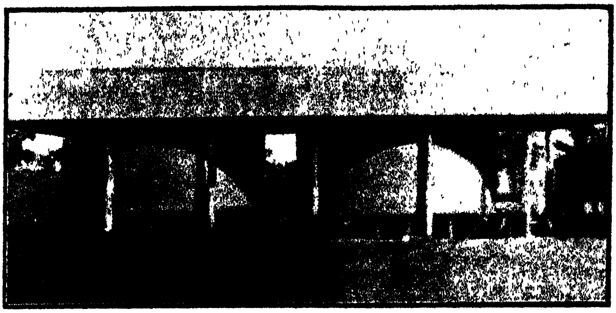
tanks, each holding 1,100 bags. These silos are kept full of oats. An elevator is used to fill them; it is built on wheels, is portable, can be driven by a 1½-h.p. engine, and is capable of elevating 100 bags an hour.

There are other types of galvanised-iron silos which are used to some extent, particularly in the southern portion of the district. A firm at Yarrawonga erects silos of 1,100 bags capacity for about £100. These tanks have a conical roof, are stayed with angle iron, and are quite satisfactory.

Mouse-proof Sheds.

Oats and maize are sometimes stored in mouse-proof sheds. The sheds are made of galvanised iron and are carefully built, so as to leave no openings for the entrance of mice, particular care being taken at the door, tops of the walls, and bottoms of the walls. The bottom of the door is usually

placed 2 or 3 feet above the ground level; the floor is generally made of concrete, and the bottoms of the sheets of iron forming the walls are embedded in it. Those that have these mouse-proof sheds find them very satisfactory, but for convenience and effectiveness the galvanised-iron silo is preferable.



Mr. T. J. A. Fitzpatrick's Oat Silos at "Erin Vale," Junee.
Capacity, 1.100 bags of Oats each.

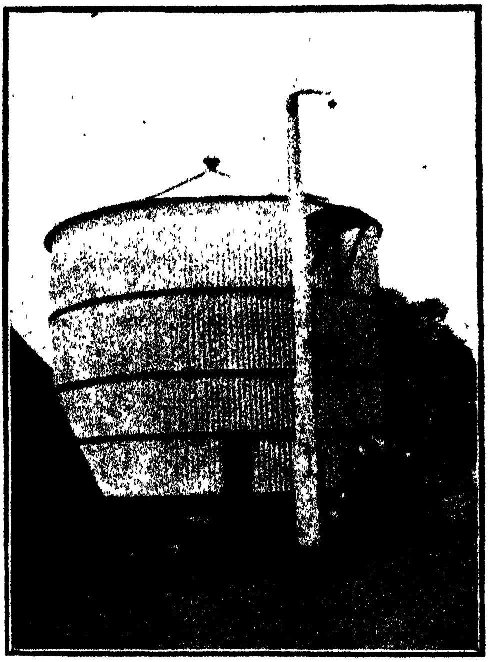
Another View of Mr. Fitzpatrick's Silos.
Note the Moveable Elevator, which is driven by a 1½ h.p. engine.

Pressed Hay.

Now to consider the question of baled hay. Whether it be lucerne or oaten hay, it is much handier and safer if pressed into bales and stacked than if stacked loosely in the ordinary way, or in the case of oaten or wheaten if in sheaves and stacked. Baled hay retains its colour and nutritive value much better than stacked hay. It is also proof against mice and birds; the former cannot gain access to a properly-pressed bale. It occupies less shed space than loose hay, and when it comes to feeding out

in drought periods the baled hay is most convenient. It is just a matter of taking out the requisite number of bales each day. It is far simpler than breaking into a stack—much quicker and not half the labour.

The original cost of baling hay is higher than putting it into a stack. The chief cost, however, is the initial one of plant, but once the feed is baled and stacked it is very handy, not taking up much space, and is ready to be carted out for feeding. It is also a very handy form for transferring to other districts should it be sold. Baled hay is so easily handled on rail, &c., and it is such an excellent feed for sheep in dry times, that there is



This Silo, situated on the Farm of Messrs. J. H. Kendall and Son, Yarrawonga, cost £100 to erect. It has a capacity for 1,100 bags of Oats and is equipped with two Emptiers.

a great opportunity awaiting mixed farmers in the wheat districts to bale oaten hay and store it for their own use, and also to keep a surplus for sale in times of drought to graziers further west who do not grow hay.

During the last severe drought in Queensland hundreds of tons of baled lucerne hay were taken to the droughty areas from Gundagai at very remunerative prices to the growers. The rail journey was tremendous, but the graziers were glad to get it. It paid, apparently, to rail it that great distance.

If more oaten hay was baled and stacked in our wheat districts more sheep could be safely carried in these particular parts, and in addition, when drought came to the sheep districts farther west there would be a

good supply of excellent fodder in handy form, and only a comparatively short distance from the country in need of it. The farmers in the wheat districts would really need to grow and bale sufficient oaten hay for their own use in drought time, and in addition have a surplus that could be sold to graziers. Oats (grain) stored in the silos as previously mentioned would also be available, and on both these forms of feed the labour of handling and transporting would be small. Some such system must come sooner or later if our wheat districts are to carry all the sheep they are capable of running and if the maximum use is ever to be made of the great grazing areas farther west. The up-to-date methods of baling lucerne hay at Gundagai are described in a departmental leaflet which is available to farmers. The same methods could be adopted for handling oaten hay.

Feeding.

In drought time it is advisable to commence feeding before the sheep get too low in condition. Sheep do reasonably well on silage alone for short periods, but if they have to be fed for any considerable time it is not so satisfactory. Whenever possible a little wheaten, oaten, or lucerne hay should be fed along with the silage. Grain, either maize or oats, is also of great value for feeding with silage, or if no silage is available it can be used by itself or with hay. There is usually a small amount of feed to be found in the paddocks in drought time, and a ration of hay alone or grain alone is often sufficient. When, however, there is practically no natural feed whatever, a ration of 2 lb. of silage with ½ to 1 lb. of lucerne or oaten hay per head would keep the sheep going well. If grain was used instead of the hay from 2 to 6 oz. per head of maize or oats would be sufficient with the silage. A plentiful supply of salt is, of course, necessary when feeding sheep.

"Agricultural Tenancies in England"

As a short statement of the history of land tenure in England, an article contributed by Sir Henry Rew to the *International Review of Agricultural Economics* perhaps hardly has an equal, and every student of this highly complex subject should be familiar with it. Apart from its history English land tenure is practically unintelligible, but by tracing its evolution from Norman times, and even antedating some customs to Saxon days, the broad rights under which land is now held and the relations of owner and occupier (landlord and tenant to-day) are presented in a useful form. The matter is even brought down to present times, when the interest of the nation as a whole in the use to which land is being put is becoming an acknowledged principle.

Our copy from the International Institute of Agriculture, Rome.

Lamb-raising should be regarded as a special branch of sheep-farming. The lamb to be suitable for export must be the requisite weight and shape, and be produced as quickly as possible. For local consumption the lambs should be sold when in the pink of condition, but should not be too heavy.—E. A. Elliott, Sheep and Wool Expert.

Lamb-raising Trials, Season 1926.

J. M. COLEMAN, Senior Sheep and Wool Instructor.

Bathurst Experiment Farm.

LAMB trials were again conducted at the Bathurst Experiment Farm during 1926. The breeds employed were Dorset Horn and Ryeland rams crossed with Border Leicester x Merino ewes. One hundred were used in each case and 2 per cent. of rams. Mating was commenced on 12th January and terminated on 24th February.

The pastoral conditions throughout the year were good; the ewes were on stubble and fallow paddocks for the major portion of the year, with occasional access to fodder crops.

Lambing commenced on 14th June, 1926, and approximately fifty ewes lambed during June, but the greater portion lambed during the first fortnight in July. As is usual at Bathurst Farm, the ewes were yarded every night throughout the year.

The following table shows details of the lambing:—

Breed of Lamb.	Ewes Mated.	Ewes Assisted.	Ewes Died.	Lambs Born.	No. of Twins.	Lambs Died.	Ewes Missed.	Lambs Sold.
Dorset Horn Cross ..	100	5	..	119	27	3	8	116
Ryeland Cross ..	100	9	1	113	23	14	9	99

The following table gives the average weight of lambs at the ages of one and four months—they were sold on 15th November:—

Breed of Lamb.	First Weighing (29th July, 1926).	Second Weighing (21st Oct., 1926).	Average Increase over 84 days.
	lb.	lb.	lb
Dorset Horn Cross	28·85	81·1	52·25
Ryeland Cross ..	27·2	74·95	47·75

It is worthy of mention that although the Dorset Horn cross lambs weighed heavier, as shown above, they did not realise the prices of the Ryeland cross. This is due to either one of two reasons—(1) that the Dorsets were too heavy, and not suitable to the export trade (exceeding 38 to 40 lb.), or (2) that the Ryeland appears the heavier lamb. I consider it is due to the latter, the Ryeland cross, owing to its short legs and low-set appearance, giving the impression of being the heavier dresser.

This characteristic in the Ryeland cross must prove a valuable factor in the ultimate returns from the lambs.

The following table shows the net returns per ewe mated, exclusive of wool returns:—

Breed of Lamb.	Ewes Mated.	Lambs Sold.	Average price per Lamb.		Total Pelt Value of Lambs.			Ewes Died at Lambing.	Value of Ewes per Head.	Value of Ewes Died.	Net Value of Lambs.			Average return per Ewe Mated.	
			s.	d.	£	s	d.		s.	s.	£	s.	d.	s.	d.
Dorset Horn cross ...	100	116	21	3	118	5	8	...	20	..	118	5	8	23	7
Ryeland cross	100	99	21	7	107	0	0	1	20	20	106	0	0	21	2

A similar experiment was also conducted at Cowra Experiment Farm during 1926, but, as some of the lambs were also used in a feeding experiment, the results were affected.

"The Care and Handling of Milk."

In "The Care and Handling of Milk," Professor Harold E. Ross (Professor of Dairy Industry, New York State College of Agriculture at Cornell University) presents what is "intended as a text for dairy students and as a guide for all who are interested in the care and handling of milk, and in its use as a food." In a well-illustrated volume of 342 pages, the author discusses the numerous aspects of what is characterised as a national problem, traversing in the course of the twenty or so chapters a quantity of interesting ground. The character of the book is essentially practical, and the fact that it is written for American conditions qualifies only a little its value for students and dairymen elsewhere.

Our copy from the publishers, Orange Judd Publishing Co., Inc., New York.

Market Reports and the Possibility of Improvement.

The suggestion has been made to the Department of Agriculture on more than one occasion that the Department should establish an information office by which farmers in the wheat belt will be able to receive regular information of wheat prices, both Interstate and overseas.

The matter was made the subject of special inquiry by the Hon. W. F. Dunn during his late visit to England. Mr. Dunn ascertained that oversea information is obtainable only through the channels at present established, from which source the press now derives its information, but he arranged for further information to be collected and communicated to him.

Since the Minister's return, and following further inquiries by the Agent-General for New South Wales in London, an offer has been received from a London firm to forward weekly notes of the wheat market for a commission of £50 per annum, and approximately £2 10s. per week for cables, but a perusal of the specimen notes forwarded makes it evident that the expense involved would not be justified, as the notes merely represent a duplication of information which the press already disseminates. It is proposed to check local prices at a later date in order to ascertain whether any improvement can be effected in that direction.

Storage of Maize in Coastal Districts.

(Concluded from page 261.)

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.

Field Methods of Minimising Weevil Damage.

METHODS have already been given for dealing with the early maize crop to the best advantage. This crop develops weevils so badly, however, that any further means of minimising the damage should be considered. Such maize is generally brought into the barn or shed and stored for a time until it is fit to shell. Infestation of the crop can be reduced in the field by cleaning up the barns and sheds early in the spring when the over-wintering life commences to multiply; a pair of weevils killed then will mean several hundred thousand less at the end of the season. This cleaning up of the barns and sheds is facilitated by following the recommendation previously given to thresh the maize (usually from the late crops) held on the farm at this time, and either to sell it or store it in tanks. This will leave the shed or barn ready for receiving the early maize crop in January or February. The cleaning of the sheds must be thorough if all risk of infestation from this source—in the field and when harvested—is to be removed. Weevil-infested maize or refuse about the barns and about the field from the previous season's crop constitutes the greatest menace, being the first source of infestation of the early crops in the field in summer.

Sheds for holding maize are best constructed with a concrete or tight wooden floor, but in many cases (by design, or because of the rudeness of their construction) the sheds have an open floor through which much refuse falls, and the shed floor is so close to the ground that there are no easy means of removing this refuse, which is literally full of weevil life. In such sheds, the best that can be done is to get some sort of deterrent, such as a mixture of naphthalene and slaked lime (1 part to 20), and heavily dust it through the floor to cover the refuse.

Clean harvesting in the field and good deep ploughing soon after harvest also deprive the weevil of cover and breeding ground or material, and assist greatly in minimising the carry-over of life and subsequent field-infestation of the early crops.

The continued selection, especially in early maize, of ears which are effectively covered with a long, close fitting husk that keeps out weevil is another means of minimising damage, and should receive attention from every coastal farmer. Unfortunately little or no attention is being paid to this possible phase of improvement. With the advent of combined husking and shelling machines, seed maize selection has largely become a lost art with many farmers, but, from the standpoint of lessening weevil injury alone, coastal farmers will find continued selection for the improvement of the husk covering well worth while.

The question arises whether it is better to harvest maize in the husk or to husk it from the standing stalks. The usual method on the North Coast

is to pull the ears in the husk and store in the shed until fit to shell or until required. On the larger farms contract or private husker-shellers are used, but on the smaller farms hand-husking is resorted to, followed by shelling with a small machine by the farmer himself.

On the South Coast and in the cooler tableland districts, where weevils are not very injurious or are altogether absent, and where the winters are colder and the maize takes longer to dry out, it is advisable or necessary that the ears should be husked before storing. On the average North Coast farm, maize in the ear, either husked or unhusked, cannot be successfully fumigated in the usual type of shed, and the question is, how does maize keep best—husked or unhusked? It has been mentioned that in the case of early maize on the North Coast, it is better on reasonably small areas to husk from the standing stalks, thus ridding the ears of a large number of weevils, and reducing the number carried into the storage sheds. For it is better, as previously stated, that this early maize should not be kept long. Even late maize should not be kept too long in the cob; it is better shelled and stored as shelled grain. But where there are no facilities on the farm for storing as shelled grain, and where late maize has perforce to be kept on the cob, it will be found best on the North Coast to keep it in the husk. Such late maize is not greatly infested at harvest (in the winter), and if it were husked it would be at once exposed to weevil which had been breeding in the shed from the early crops. Unhusked, only those ears which are not well covered with husk are infested for the most part, and with a variety which has been well improved in respect to its husk covering, late maize stored in the husk will keep very well for some time. It has been suggested that, in average varieties, it would be a good plan to separate at harvest the well covered ears from those poorly covered with husk, and that the former could then be kept for a very long time, but this is not quite a practical suggestion. Moreover, detection of infested ears from the appearance of the husk in every case is scarcely possible, while earworms and rodents lessen the protective value of the husk covering in storage, so that apparently resistant ears may become infested.

Summing up, it appears that the North Coast farmer would be best advised to husk the early maize at harvesting if the area is not too large and if hand-husking is the usual practice on the farm, and to harvest and store the late crop in the husk. At present, for the most part, the whole of the maize crop is harvested and stored in the husk.

Treatment of Ear Maize in Storage.

Maize sheds on the North Coast are generally of open batten or slab construction, allowing the air to enter freely so as to facilitate drying of the ear corn. These sheds cannot be made sufficiently airtight for effective fumigation without much trouble, and even if they could be temporarily closed for fumigation of the maize, they would have to be opened soon afterwards to allow the maize to dry, and it would then become again infested with weevil. This is because fumigation does not kill weevil in all its stages, the egg stage (and probably the pupal stage) escaping the

effects of the gas, and when fresh air is admitted these stages of the insect pursue their development if other conditions (warmth, moisture, &c.), are favourable. In some quarters it has been suggested that a small specially-built, airtight chamber or room might be added to the shed, and that all maize which is to be stored in the open shed be first fumigated in this chamber in small batches, as it is brought in from the field. But, as previously mentioned, re-infestation may take place in the shed after fumigation, and it does not seem to be worth while fumigating maize in this way. As it is so difficult to do anything in the way of treating maize in the ear in the storage sheds, storage of any quantity for any length of time in this form is not advisable. There is an impression current that maize in storage requires to be aerated to be kept properly, but this does not apply to maize that is sufficiently dry.

As soon as storage in the ear has gone on long enough to dry the maize down to a safe moisture content for shelling and storing in bulk the programme should be proceeded with. As already stated, this will be about September or October on the North Coast.

Tank Storage of Shelled Grain.

There are two essentials for the safe storage of maize grain in bulk—

(1) A moisture content sufficiently low to prevent heating or mould.

(2) Reliable precautionary measures and effective treatment against insect pests in storage.

In tank storage it must be borne in mind that the maize has no means of getting rid of any surplus moisture, and that once it is in the tank if it begins to heat the whole mass may be totally spoiled. Great care must be exercised in seeing that the maize has dried out sufficiently if such loss is to be avoided. It may be reckoned that maize grain is safe for bulk storage when its moisture content is below 14 per cent. Innumerable instances of the safe storage of maize in tanks in different parts of Australia can be given, and there need be no fear of damage from heating, provided the moisture content is sufficiently low. If any farmer is in doubt as to the moisture his maize contains, a sample sent to the Department of Agriculture in an airtight tin or bottle will be examined and an opinion given as to whether its storage would be safe.

The remaining essential for safe tank storage of maize is the treatment for weevil. On the North Coast, or, for that matter, in many other parts of the State, it must not be taken for granted that weevil is not present in the maize because it is not visible. The grain may be quite sound and yet may carry the eggs which later hatch out and develop the larvæ. So that when even visibly weevil-free maize is put into an airtight tank, it must be remembered that weevil in some form is introduced into that tank.

Now the weevil is a very hardy insect, and will find most conditions favourable for its life, if not for its active development; but there is one thing that it cannot withstand—an absolute depletion of oxygen for any length of time. It can live on a very small amount of oxygen, but if totally deprived of it for long it will succumb.

There are three methods of displacing the oxygen in a tank, and each has proved eminently successful in killing weevil and in preventing any further damage by it in any of its forms:—

(1) The tank is filled *absolutely* full of maize to the extent of ramming down the last bit put in, so that there is no space in the tank unoccupied. If the tank is airtight and the lid is then sealed on, any weevil present will soon be killed; the vital processes going on in the grain probably use up the oxygen in the tank, and produce carbonic acid gas. The maize can be stored thus indefinitely. This has been amply proved by tests at Grafton Experiment Farm with maize which was badly infested with weevil when tanked. Thus, without fumigation of any kind, maize can be kept sound in a tank.

(2) After nearly filling the tank with grain, a lighted candle is placed on top and the tank sealed. The burning of the candle exhausts the oxygen, and the atmosphere in the tank mainly consists of carbonic acid gas, which kills the weevil.

In these two methods the efficacy of the treatment depends on the complete sealing of the tank, a nail hole or crack being sufficient to jeopardise success.

(3) When the tank is not absolutely airtight or cannot be made so, recourse must be had to fumigation. For this purpose nothing better has so far been discovered than carbon bisulphide. This is a heavy liquid which is completely volatile, evaporating on exposure to the air. It must, therefore, be kept in a tightly-stopped container. When carbon bisulphide evaporates it forms a rather foul-smelling gas which is about two and a half times heavier than air, and thus, if the liquid is poured on to the maize at the top of the tank, the gas at once diffuses and penetrates the mass of grain completely. There is no danger of the largest mass of grain not being fully penetrated by the gas if sufficient is used to saturate the air space. Carbon bisulphide is a very inflammable liquid or gas and will explode like benzine if a naked light is brought near it.

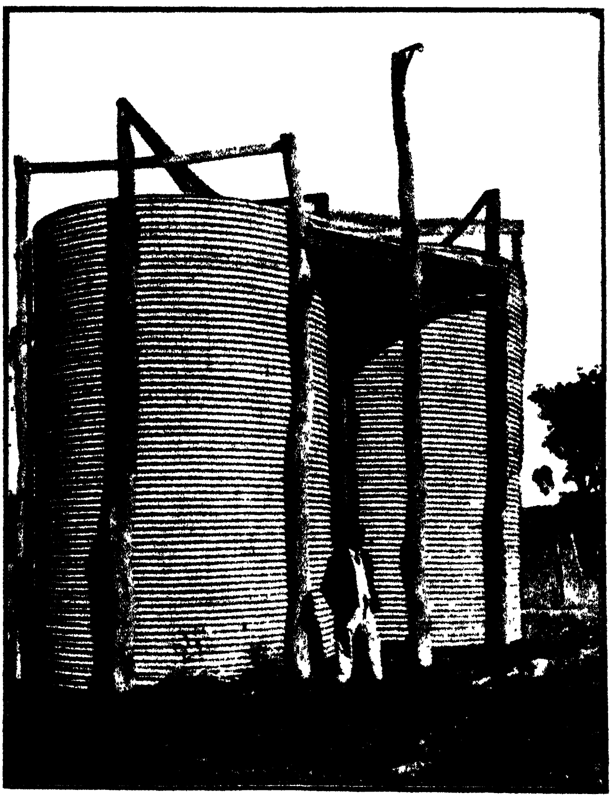
If the tank is airtight or nearly so, 4 or 5 lb. of liquid carbon bisulphide are sufficient for 1,000 cubic feet of air space. Where the tank is obviously not airtight this quantity must be increased fourfold or more. A well-constructed tank can, however, be made quite gas-proof, and this will ensure greater success in keeping the maize, as well as lowering the cost of fumigation. A tank of 1,000 gallons capacity will contain 160 cubic feet and will hold about 128 bushels of shelled maize. Less than 1 lb. of liquid carbon bisulphide would be required for this cubic content if it were free, but as much of the space is taken up by the maize, about ½ lb. will suffice for this quantity of shelled grain. In the large concrete silos at Atherton, North Queensland, 700 tons of maize is satisfactorily fumigated in one bin 70 feet high, with 2½ gallons of carbon bisulphide with the bin tightly closed.

The cost of fumigating grain with carbon bisulphide as above is about one-thirtieth of a penny per bushel. No other fumigant is as cheap.

Fumigation is best done in the warmer part of the day if in winter. Not only are the weevils more active under the warmer conditions, but they are more susceptible to the effects of the gas.

The liquid should be poured straight on top of the maize in the tank and the lid put on and sealed at once. If the tank is quite airtight no more fumigation is needed, but if the gas can escape even slowly, or if the tank is opened up at any time, it will require another fumigation.

Fumigation with carbon bisulphide does not injure the grain for food, the disagreeable odour passing off on exposure to the air. Neither does fumigation with this substance injure the seed for germination, providing the maize does not contain any excess moisture. A common practice among Clarence River farmers is to keep seed of the early crop by sealing down in a can with carbon bisulphide until planting time, about nine months later.



Tanks used for Storing Maize on the Farm of Mr. J. Kozminsky, Cootamundra.

If the moisture content is excessive and the seed is subjected to the gas too long, the viability or germinating power of the seed will be injured, so that if there is any doubt about the moisture content of seed maize it should be fumigated for twenty-four hours and then aerated, with another treatment in two or three weeks' time.

The tank should not be filled with maize, nor should fumigation of seed maize take place on a very humid day, as the grain may take up sufficient moisture to cause trouble from heating, or from injury by the gas in the case of seed maize.

Type of Tank for Storage.

The ordinary corrugated galvanised-iron container is the most efficient and economical for the storing of maize on the farm. The storage may be done in one large tank or several small ones, as desired, though the large specially-constructed tank will be found cheaper. Provided the maize is quite dry and safe for storage in bulk, it can be bulked in any quantity without danger from heating without any turning, stirring, or aeration. It is only when its moisture content is doubtful or over the safe margin that such treatment is necessary. Facilities for these treatments are usually provided for in large-scale silo storage, but as they must necessarily be dispensed with in individual tank storage on the farm, it can be seen how important it is to have the maize of sufficiently low moisture content. It may be thought by some that several small tanks are safer than one large tank for storage on the farm, because if a portion of the maize is unexpectedly high in moisture and begins to heat the loss is confined to one tank, but it must be reiterated that with the proper safeguards as to moisture content, no trouble is likely to arise from this quarter. Several small tanks in place of one large one may, however, be preferred for convenience in filling and emptying.

The tank (or tanks) must be made absolutely impervious to rain, and it is necessary either to have a well-constructed and soldered top, or else to put the tank under cover. For efficient and economical fumigation, and to keep out moisture and air, the sides must be rivetted and soldered where the iron joins or fits together, and the bottom of each higher ring should fit outside the top of the lower so as to prevent water finding its way into the tank. If not covered, the top of the tank should be constructed in such a way, and a method of filling devised that will not allow the top to become dished and hold water. A scaffolding and small platform used in the operation of filling such a tank is essential in the absence of a firm, raised top and a specially-constructed porthole for filling.

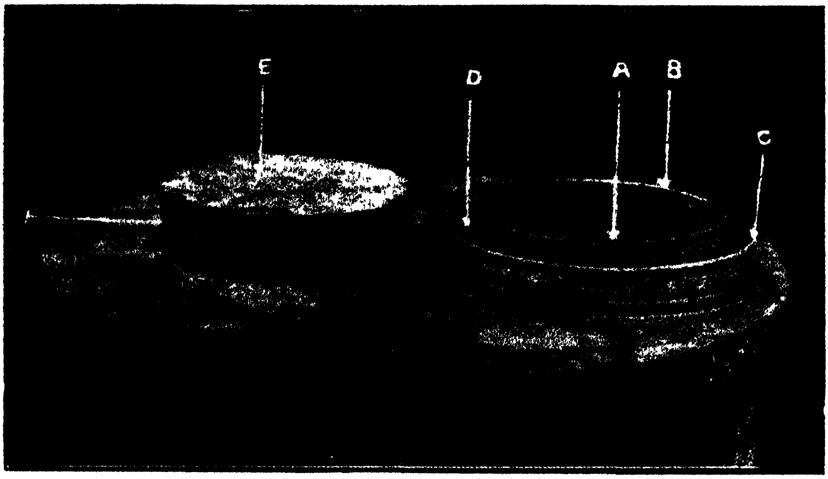
An excellent idea for an opening in the top of the tank has been devised at the Experiment Station in the Island of Guam* (see illustration), where the climate is so damp, especially during the rainy season, that maize takes up moisture and readily spoils if left exposed to the air. Such conditions also occur on the North Coast, and possibly in some other parts of New South Wales during wet seasons, and the idea is worth putting into effect in tank-storage here.

The usual opening in the top of the tank (A) is surrounded by a collar (B) 1¾ inches high; 1 inch outside this ring there is soldered another collar (C), which is ¼ inch less in height. The opening is closed with the lid (E),

* Guam Agricultural Experiment Station Extension Circular, No. 3.

which has a flange (F) that fits over the inner collar. The tank is sealed by pouring oil into the space between the two collars (D). The flange of the lid goes down into this oil and thus makes it impossible for any moisture or insects to get into the tank. The inner collar is higher than the outer collar, and keeps the oil from getting into the tank. Care should be taken to have the flange on the lid of sufficient depth to go down into the oil, because it is this feature which makes the tank a good container.

In the case of a single tank of several hundred bushels, the bottom rings should be of stronger guage iron than the top rings in order to stand the greater pressure, and solid uprights should be placed round the tank to hold it against the wind when empty. A substantial flat support of timber or concrete must be laid for the tank to rest on, and some favour building this at ground level to save the cost of a high support, filling the bags from



Top of Metal Storage Tank devised by Guam Agricultural Experiment Station.

the tank by having a small pit to hold the bag in front of the outlet. In view of the trouble likely to be experienced in coastal districts in keeping this pit free from water, and the comparatively small expense of erecting a stand of sufficient height to allow of easy filling into bags from the tank, it is considered that the latter system is advisable.

A tank of 1,500 gallons capacity will contain about 240 cubic feet, and will hold about 196 bushels of maize. Large galvanised-iron tanks of about 1,200 bushels capacity, with timber stand, have been built in New South Wales at a cost of about £40, and smaller tanks with the necessary stand would not cost more than 1s. per bushel capacity. Such tanks are not subject to rust like water tanks, and therefore have a much longer life, and the interest charge on the cost of construction of tanks for storing maize may be reckoned to be less than 1d. per bushel. This should put them within the reach of every farmer, and within the range of ambition of every coastal maize-grower who wishes to make more profit from his crop.

Cabbage and Cauliflower Trials on the Hunter.

J. DOUGLASS, H.D.A., Agricultural Instructor.

PRACTICALLY every farmer on the Lower Hunter River is more or less interested in the raising of cabbages, the area sown by individual farmers varying from a few head for home consumption to 4 acres. Many of the larger growers supply Sydney and distant markets with bulk lots during the cutting season, and there is a good demand locally from Newcastle and the southern coalfields.

The main portion of the district used for cabbage and cauliflower growing is the river flats, where the soil is a very rich, deep alluvial deposit, well supplied with organic matter, and most suitable for the production of many vegetable crops, and where during the winter months the conditions are usually very good for the raising of cabbages, &c. Practically no irrigation is used in the district. The chief variety grown is Drumhead, although many others are tried with varying success.

Messrs. A. Gordon and A. R. Meade co-operated with the Department this year in conducting trials on the Bolwarra Flats, which are banked off from flood reach and are typical of a wide area of alluvial country.

A manurial trial was conducted on Mr. Gordon's farm, with the object of ascertaining the most suitable manure to use on the cabbage crop, and whether top-dressing with a nitrogenous manure is advantageous. The land was in good condition, and well supplied with moisture at planting time. This grower makes a practice of sowing the seed direct in the field by means of a seed sower. The variety used in the experiment was Enkhuisen Glory, and manure was distributed along the plots and mixed with the soil before the seed was planted. The seed was sown in rows 3 feet apart on 4th April, 1926, and a good germination resulted throughout the plots. The early growth was rather slow, and the vegetable weevil (*Listroderes* (*Desiantha*) *nocixa*) considerably damaged the plants when only 2 inches high. It was apparent in the early stages of growth that the various fertilisers were having a stimulating effect on the crop. Top-dressing with sulphate of ammonia at 1½ cwt. per acre was carried out on 15th July, 1926. A half section of the whole experiment, including the unmanured plots, was top-dressed.

The plots treated with manures heavily charged with nitrogen made rapid growth, and produced heads ready to cut before other treatments. The untreated plots were backward in growth during the whole growing period

and failed to produce the same number or size of heads as the manured plots. The season was not a favourable one for cabbage-growing, as the rainfall was badly distributed. In the latter stages of growth rain was badly needed, and the cabbage moth was beginning to make its presence felt. The first cabbages were cut and weighed during early August. Harvesting was carried out until mid-September, when the crop was destroyed by hail.

Although the final figures were unobtainable a good deal of information was derived from this trial. The outstanding results obtained from all treated plots indicate that even on the fertile soils of the Bolwarra district, the cabbage crop will readily respond to artificial fertilisers. The two outstanding plots, M3 and P3, were both heavily charged with nitrogen, and it is evident that this element is of great importance to this class of crop. Both blood and bone and P7 contain a small percentage of nitrogen, and gave better early results than superphosphate. The superphosphate plot, however, responded to the top-dressing much better than either P7 or blood and bone. Undoubtedly top-dressing with sulphate of ammonia, when the plants are beginning to heart, has a beneficial effect, but the outstanding results of P3 and M3, and the relative failure of the latter to respond to top-dressing, would indicate that sulphate of ammonia applied in the earlier stages of growth would give better results. This feature has been successfullty demonstrated in similar experiments recently carried out in the United States.

As the crop was practically destroyed during September, the figures showing the heads cut to 16th September illustrate the results of the experiment more accurately than the total. The relative earliness can also be judged by the former figures.

MANURIAL Trial with Cabbage.

	P3 77 lb. p.a.	M3 582 lb. p.a.	Superphosphate 448 lb p.a.	P7 426 lb. p.a.	Blood and bone 448 lb. p.a.	No manure.
Top-dressed with 1½ cwt. sulphate of ammonia.						
Number harvested 16th September, 1926	91	96	36	33	30	12
*Total	240	231	213	210	219	156
Not top-dressed.						
Number harvested 16th September, 1926	66	90	18	27	30	3
*Total	192	210	201	195	210	120

* The totals are only approximate, as many heads destroyed in the hailstorm were included in this count.

The Variety Trial.

Mr. A. R. Meade conducted variety trials with cabbages and cauliflowers The object of these experiments was to ascertain the most suitable varieties of these crops to grow in the district. Owing to the adverse conditions prevailing during the summer these trials had to be resown in the seed-bed. The second planting was made in a prepared seed-bed on 24th March, 1926. The seedlings were planted out into the field under ideal conditions on 25th April. The season was not a good one for the cultivation of this crop, and the results obtained were only fair. It has been considered advisable to repeat these experiments in the coming year.

The following varieties of cauliflowers made a good showing in adverse circumstances, and will be watched with interest in subsequent trials.

Late Metropole.—A very promising late variety which takes about nine months to mature. The plants show great vigour, and produce an abundance of long, incurving, protective leaves. The heads are medium in size, but under more favourable conditions should considerably increase in size. They mature evenly, are solid, and of very clear colour.

Special Giant.—This variety matures about three to four weeks earlier than Late Metropole. The leaves are abundant, but not so protective as the previous variety. The heads are round, compact, medium to large in size, and very white.

Other varieties tested were Vietche's Autumn Giant, Early Eclipse, Sutton's Early Giant, and Early Phenomenal.

Practically the whole of the cabbages planted in the district at this period experienced a bad time, and produced only fair crops. The cultural details of this trial were identical with those of the cauliflower trial. The following varieties of cabbages were included in the experiment :—Winningstadt, Succession, Burpee's Surehead, Burpee's Allhead, Utility, Early Jersey Wakefield, and Drumhead.

Winningstadt.—An early midseason variety of cabbage; showed up well in the trial. The heart is solid, medium in size, and pointed. It is not liked by some growers owing to this last feature, but otherwise is a good short-stemmed type.

The *Early Jersey Wakefield* is another pointed variety, maturing very early. The quality of this cabbage is excellent, but, owing to its small size, it was not favoured.

The variety of cabbage (Enkhuisen Glory) used in the manurial trial is worthy of mention. Mr. Gordon has been very successful with the growing of this variety over a number of years. Normally the heads mature very quickly, but under adverse conditions the plants take much longer to heart. The heads are practically round in shape, white, and very solid. Few outer leaves are produced, thus favouring a closer planting than in varieties such as Drumhead and Succession. When cut the heads of Enkhuisen Glory cabbage retain their hardness for some time, and it is the best keeping cabbage brought under the notice of the writer.

Farmers' Experiment Plots.

POTATO TRIALS, 1926.

Murrumbidgee Irrigation Areas (Griffith Centre).

E. B. FURBY, H.D.A., Agricultural Instructor.

TRIALS with potatoes were conducted by the Department during 1926 with the co-operation of the following settlers :—

F. Spratt, Farm No. 1838, Lake View, Griffith.
R. A. Smythe, Farm No. 1857, Lake View, Griffith.

Not for quite a few years has a season been so unfavourable for potato growing. From the time of planting till harvesting there was practically no rain of any benefit to the crops, with perhaps the exception of 47 points which fell towards the end of October. Even this rain brought along an attack of early blight which seriously affected the crops, and from which they did not thoroughly recover. In addition the season has been a fairly warm one with hot scorching winds, causing quick and high evaporation of soil moisture. Consequently it was a difficult matter to maintain the even moisture content in the soil that is so desirable for the growth of good potatoes.

The Crops.

Farm No. 1838.—This plot was sown on a coarse sandy loam, red in colour, which holds moisture fairly readily. A crop of potatoes was grown on it the previous spring. Land ploughed early in winter and fallowed till planting when again ploughed. Sets ploughed in on 8th September, in rows 3 feet apart, and sets 12 to 15 inches apart; P3 mixture at 4 cwt. per acre. Soil being in very good condition, very good germination obtained; three irrigations, commencing one month after planting; crop cultivated four times but not hilled.

Farm No. 1857.—Soil here much heavier red loam of fair depth; ploughed in June 7 inches deep, and again early in August, harrowed; in fair condition when sets were planted on 10th September; covered by harrows. One irrigation was given just before flowering in October; hilled up twice; fertiliser as in the previous plot.

The results from the two plots were as follows :—

	Farm No. 1838.	Farm No. 1857.
	t. c. qr. lb.	t. c. qr. lb.
Early Manhattan	2 18 3 20	4 3 0 6
Factor	1 19 2 20	2 7 0 6
Satisfaction	1 18 1 23	1 3 3 11
Early Rose	0 19 3 20	1 11 1 20

Comments.

Of the varieties under trial, all of which are fairly well known on the area, and have at different times given varying degrees of success, Early Manhattan is the only one which has given consistent good yields over a period of years. Early Manhattan and Early Rose were the only two varieties which gave a reasonable percentage of marketable tubers. From Satisfaction and Factor in both plots, the marketable tubers obtained were negligible The reason may be that the two earlier varieties did not suffer to the same extent from early blight, and made a better recovery from the attack. Had these plots been sown, say, three weeks earlier, perhaps better results would have been obtained. The first week in August is not considered to be too early for planting. Some damage may result from frosting, but this can be repaired to a large extent by harrowing the crop.

Lower Hunter River.

J. DOUGLASS, H.D.A., Agricultural Instructor.

The following farmers co-operated with the Department of Agriculture in conducting potato experiments during 1926, viz. :—

A. McKimm, Bolwarra.
H. Whitman, Bolwarra.
N. Porter, Hinton.

Practically the whole of the potatoes grown in this district are planted in the late winter months, with the object of placing the crop on the early market. The variety universally grown is Satisfaction. Practically no artificial fertiliser is used in the district, the farmers depending on the natural fertility of the soil to meet all requirements. The soil on which these experiments were conducted is deep alluvial loam, well supplied with organic matter.

A. McKimm, Bolwarra.—Previous crop water melons, residues of which were ploughed under during March, 1926; land allowed to remain in the rough, to be broken down and sweetened during autumn. Fallow was reploughed during June. At planting time land was well supplied with moisture, weed-free, and in perfect physical condition; varieties planted in rows 3 feet apart on the 10th August. Half of each plot dressed with superphosphate at 2½ cwt. per acre; remainder unmanured. Immediately after planting plots were harrowed, and this was continued at intervals until rows well defined, when single horse cultivation carried out.

H. Whitman, Bolwarra.—Manurial trial conducted here, with object of ascertaining most suitable manure for potato crop. Fallowing and careful cultivation carried out and planting was conducted under ideal conditions;

plots carefully laid out and unmanured check plots placed at each end and in the centre of the experiment. Planting took place on 9th, 11th, and 12th August, 1926; variety, Satisfaction.

N. Porter, Hinton.—From germination this experiment was subjected to most severe and persistent attacks from cutworms and vegetable weevils, and in later stages of growth the crop was subject to attack from Rutherglen bugs. These pests in combination with the very dry season made the results incomparable, but the section of the trial treated with superphosphate gave a much better yield than the untreated.

VARIETY Trial on Farm of Mr. A. McKimm, Bolwarra.

	2½ cwt. superphosphate.	No manure.
	t. c. qr. lb.	t. c. qr. lb.
Early Rose	2 4 0 22	1 16 0 16
Satisfaction (Starr)	1 15 0 10	1 8 1 4
Factor	1 10 3 10	0 19 1 0
Carman No. 1	1 8 1 4	1 5 1 10
Satisfaction	1 5 0 16	....
Batlow Redsnooth	1 1 2 12	0 16 0 12
Tasmania Brownell	1 0 2 14	0 16 2 24
Satisfaction (Parson's) ...	....	0 18 0 8

MANURIAL Trial on Farm of Mr. H. Whitman, Bolwarra.

Manure.	Yield.
	t. c. qr. lb.
Superphosphate, 560 lb. per acre	1 6 1 5
* P10, 364 lb. per acre	1 5 3 16
Superphosphate 2½ cwt., top dressed with 1 cwt, sulphate of potash	1 5 2 9
P7, 254 lb. per acre	1 5 0 25
Superphosphate, 2½ cwt., and 1 cwt. of sulphate of potash ...	1 4 0 25
P1, 322 lb. per acre	1 4 0 2
Superphosphate, 280 lb. per acre	1 3 2 3
P2, 322 lb. per acre	1 3 2 3
No manure (average of three plots	1 0 2 19

*The composition of the mixed fertilisers was as follows:—P10, 10 parts superphosphate, 1¼ parts of sulphate of ammonia, and 1¼ parts of sulphate of potash; P7 equal parts of superphosphate and bonedust; P1, 10 parts superphosphate and 1¼ parts sulphate of ammonia; P2, 10 parts superphosphate and 1¼ parts sulphate of potash.

Comments.

The season for potatoes was one of the worst experienced in the history of the district, under 2 inches of rain falling during the growing period. When the crop was half grown a severe hailstorm occurred and seriously reduced the yield on Mr. Whitman's farm.

The outstanding feature of these experiments was the increased yields obtained by using artificial fertilisers. The best result obtained in the manurial trial was from 560 lb. of superphosphate. A new feature introduced in this trial was the top dressing of potatoes with sulphate of potash after

the crop had germinated. Although hardly sufficient rain fell to dissolve the fertiliser, the plot so treated gave an increase of approximately $1\frac{1}{2}$ cwt. per acre over a plot treated with the same fertilisers at planting time. Good results have been obtained in other countries with this top dressing, and the experiment will be repeated here. It appears to indicate that sulphate of potash being readily soluble when used at sowing time is lost in the drainage water before it can be utilised by the plant. The plot treated with $2\frac{1}{2}$ cwt. of superphosphate gave an increase of approximately 3 cwt. over the unmanured plots. With potatoes at £20 per ton this treatment shows a handsome profit in such a bad year.

The variety trial lost a good deal of its value owing to the dry year. As was expected, the earlier varieties produced the highest yields. This is the first year in which Batlow Redsnooth has been tried out on the coast. Considering it is not an early variety and that the season was severe it yielded fairly well. This variety is usually recognised as an excellent eating potato; those grown on the South Coast, however, are found to be very "soapy."

It is interesting to note that all varieties responded to the light application of superphosphate, an increase of 8 cwt. being obtained in the Early Rose variety. The results should induce farmers in this district to use a light application of superphosphate with the potato crop.

Upper North Coast District.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

The past season was not a very satisfactory one for potato growers in this district. The unfavourable weather experienced on the tablelands at harvesting resulted in difficulties in obtaining "seed" for early planting, with the result that high prices had to be paid. This, followed by a very dry season, was not conducive to good returns. The excellent market prices obtained, however, enabled most growers to clear the expenses of the crop.

The growers on the Tweed were somewhat more favoured than other parts, and where very early planting was carried out fair yields were obtained. These crops were attacked by a green caterpillar (*Phytometra chalcytes*), cutworms (*Euxoa radians*), and Rutherglen bug (*Nysius vinitor*), which did considerable damage to the haulms, but the crops being practically matured, the yields were not affected so greatly as was at first anticipated. These crops are generally marketed in Brisbane and this year excellent prices were recorded.

On the Clarence and Orara Rivers, the crops during the early stages made good growth and heavy yields were anticipated. Owing to the continued dry weather anticipations were not realised.

On the Dorrigo Plateau excellent rains were received in December and January, but they were too late for the early crops. The late crops, however, received considerable benefit.

During the past season experiments were conducted in co-operation with the following farmers :—

V. Brown, Condong, Tweed River.
T. Hannah, junior, Lower Southgate, Clarence River.
M. D. O'Connell, "Riverbyn," Coramba.
R. Grace, North Dorrigo.

The rainfall during the growing period was as follows :—

	Condong.	Lower Southgate.	Dorrigo.
1926.	points.	points.	points.
August	126	59	......
September	223	27	122
October	227	113	125
November	44	Nil	50
December	19	......	1,602
1927.			
January	......	......	989
February	......	......	16
Total	639	199	2,904

The low registrations give some idea of the extremely dry conditions experienced particularly at Lower Southgate where less than 2 inches were recorded during the growing period.

The Plots.

Condong.—Soil, alluvial loam, on the bank of the Tweed River; previous crop, winter cereals; land ploughed end of July; harrowed twice and rolled before planting, which was carried out on 23rd August. Rutherglen bug attacked all plots slightly, but did very little damage. Harvested, 7th December.

Lower Southgate.—Soil, alluvial loam; previous crop, maize; land ploughed in July; reploughed, harrowed, and rolled just prior to planting on 12th August Cutworms present during later stages, and tops of Early Rose completely eaten off; very little damage to other plots. Manurial trial harvested on 10th November and variety trial on 17th November.

Dorrigo.—Soil, very friable, red volcanic loam; land, old paspalum pasture, broken up and planted with maize previous year. Disc harrowed in July and August; ploughed at planting time on 1st September and harrowed. Harvested, 10th February, 1927.

Coramba.—No weights were taken.

RESULTS of Variety Trials.

	Condong.			Lower Southgate.			Dorrigo.		
	t.	c.	qr.	t.	c.	qr.	t.	c.	qr.
Factor	2	16	3	1	19	1	3	19	1
Carman No. 1	2	8	2	1	18	0	5	10	0
Early Manhattan ...	2	13	2	2	15	0	3	6	3
Early Rose	1	19	1	1	10	1	3	18	2
Satisfaction	2	5	0	1	14	1	1	7	2
Batlow Redsnooth ...	1	3	0	1	6	1	1	11	2

Superphosphate was applied at 2½ cwt. per acre.

The white-skinned varieties, Factor and Carman No. 1, are again outstanding in yield. It may also be noted that there is a keen demand for white-skinned potatoes on the market, and higher prices are received than for other varieties. Early Manhattan, which is generally regarded as a good hardy variety, has also done well. Batlow Redsnooth, a red-skinned variety of excellent shape and very attractive appearance was under trial for the first time in this district this season. The yield was not quite satisfactory, but as the conditions were so very unfavourable further trial should be given.

RESULTS of Manurial Trials.

Manure.	Condong.	Lower Southgate.	Dorrigo.
	t. c. qr.	t. c. qr.	t. c. qr.
*P7, 2½ cwt. per acre ...	2 17 1	2 9 3	3 12 3
Superphosphate 2½ cwt....	2 16 3	1 19 1	3 19 1
P3, 4 cwt.	2 8 1	2 2 2	4 16 2
Superphosphate, 5 cwt. ...	....	2 0 0	....
M13, 3½ cwt.	2 11 0	1 12 0	4 2 2
No manure	2 0 1	1 3 2	2 9 0

* The fertiliser mixtures consist of—P7 mixture, equal parts superphosphate and bonedust; P3 mixture, 10 parts superphosphate, 3 parts sulphate of potash, 3 parts sulphate of ammonia; M13 mixture, 10 parts superphosphate, 3 parts sulphate of potash.

At all centres the various manures gave a substantial increase over no manure. Upon the above results, either P7 mixture or superphosphate would be the most economical manure to use for potatoes in this district. At Dorrigo, however, P3 and M13 gave excellent results.

TRIAL OF SHEEP BRANDING PREPARATIONS.

DURING last season a trial of sheep-branding preparations to determine which type lasted longest on the wool was carried out by the Department at Temora Experiment Farm.

The results indicated that for marking or branding Merino sheep all the black preparations tried (all available in Sydney at the time) gave satisfaction, the brands remaining visible for 272 days (say nine months). No observations were possible after that period, as the sheep were then shorn.

Some of the red-coloured markings were entirely satisfactory, as was one of blue colour, while others were not so good, one of the blues turning black and another fading.

For marking or branding Border Leicester sheep none of the preparations tried could be considered entirely satisfactory, and none of the markings were plainly visible after 167 days (say five months). The percentage of black brands visible after eighty-three days ranged from 60 per cent. to nil, while the percentages of the best red and blue dressings visible after eighty-three days were only 40 and 50 per cent. respectively.

It is intended to continue the trials and to extend them, to test the ease or difficulty with which the branding preparations can be removed from the wool by ordinary methods of scouring.

Prickly Pear.

Botanical Description, History, and the Problem the Plant Presents.*

G. P. DARNELL-SMITH, D.Sc., F.I.C., F.C.S., Biologist and Director of Botanic Gardens.

[Concluded from page 316.]

The Prickly Pear in Australia.

Opuntia inermis had in 1919 occupied over 23,000,000 acres, and was reported to be spreading at the rate of 1,000,000 acres a year. The cost of eradicating pear by hand is so great that the value of the land when cleared does not pay for the labour. Attempts have therefore been made—

1. To find a commercial use for the pear.
2. To destroy it by mechanical means, poisons, or by natural enemies.

The feeding of pear to stock is of little use; the water content is so great, and the glochidia cause inflammation of the mouth and pharynx even if the spines are singed off. The preparation of alcohol, cardboard, or potash is not a commercial proposition, on account of the large amount of water the pear contains. No satisfactory machine has yet been invented for destroying prickly-pear. On arable land it can be destroyed by continuous cultivation, but on stony or rocky hillsides, or on land used for grazing, it does not pay to eradicate by cultivation. Pear spreads in two ways—by the growth of new plants from joints or unripe fruits that have become detached from the parent plant, and by the germination of seed. The seed is said to be spread chiefly by the emu, the black magpie, and the crow.

The first Prickly Pear Commission consisted of Professor Harvey Johnston and Mr. Tryon. They travelled round the world inspecting prickly-pear areas in 1912-1914. They issued a report and recommended that experiments in feeding prickly-pear to stock be carried out. This was done, and a report published in 1918. The main conclusion was that prickly-pear must be treated by singeing, roasting, or boiling before being fed to stock. Pear must be supplemented by protein-supplying foods. Its chief utility is as an emergency food in time of drought. Stock fed with pear require water.

The so-called "spineless" prickly-pear of Luther Burbank was much boomed. It was nothing more than a form of *O. Ficus-indica*. It was no less spineless, and no more free from fibre than plants growing in Australia. The powers of this plant to withstand drought are not equal to that of our native Old-man Saltbush (*Atriplex nummularium*), which is a good fodder plant.

Analysis of *O. inermis* by Brunnich showed that the total sugar calculated as dextrose was 0·4 per cent. Its value as a source of alcohol can be gauged from this. Under ideal conditions the amount of alcohol

* Lecture on "Cactaceæ: Methods of Destroying Opuntias," delivered before the Sydney University Botanical Society, 22nd October, 1926.

obtained was 0·5 per cent. of the pear used. The cost of concentrating alcohol from a weak solution renders the idea of getting alcohol from pear impracticable. Analyses in U.S.A. have shown that, on the average, the fresh plant contains 84·3 per cent. of water, and 2·4 per cent. of crude fibre. From 100 tons of pear 1 ton of paper pulp could be prepared, and this would be of low quality. The cost of handling is clearly prohibitive.

The ash obtained by burning dry prickly-pear contains a large proportion of potash. The extraction of this was attempted by one commercial concern, but it was not a payable proposition. No commercial use is known, nor appears likely, for the mucilage or the oxalate of lime. Destructive distillation gives acetic acid and pyridine in small amounts. The value of these and other products would not pay for the cost of distilling.

Methods of Eradication.

By Mechanical Means.—Where a few plants only occur, these may be grubbed up and burnt. The pear is burnt with great difficulty. In some cases gangs of Chinese have been engaged to grub up pear and gather it and burn in a "straddle," a peculiarly constructed pyre of logs. Sometimes the pear is crushed down by a team of bullocks dragging a huge log of timber flattened on one side and shod with steel. This has a crushing and shearing effect. Sometimes a very large spiked roller is used. These methods only pay if it is imperative to clear some small specially situated locality.

By Poisoning.—A long series of experiments were made by Dr. Jean White in 1912-1916 to determine the best means of poisoning pear. Five methods of applying poison were tested: (1) Injection of a solid specific; (2) injection of a liquid specific or solution of specific; (3) spraying of a specific by means of a spray pump; (4) spraying of a specific by means of an atomiser pump; (5) the evolution of a gas or vapour. Injection is probably the surest and least expensive. No poison is wasted. It is only applicable to scattered pear.

Among substances tested and found to be more or less injurious to pear were: Arsenic trichloride, arsenic pentoxide, arsenic trioxide, chlorine, copper sulphate, formaldehyde, and mercuric chloride. Arsenic compounds are especially toxic to pear, and in the later experiments these alone were used. The "bulb" is the most resistant part. Arsenical compounds do not apparently harm the land to which they are applied.

Analyses of plants grown upon land to which arsenic had been applied showed no appreciable quantities of arsenic, and crops of wheat and lucerne did better than on land not sprayed with arsenic. Arsenic acid (As_2O_5) is the most poisonous specific, but is not easily obtained. Arsenious chloride is the only specific available where the pear is so dense that it has to be gassed. It is a valuable spray, especially in country where water is difficult to obtain, but it is corrosive and poisonous, and requires great care in handling. Arsenic oxide (As_2O_3), or "white arsenic," used in solution, together with caustic soda, is not so efficient as the other two

compounds. It is, however, much cheaper than arsenious chloride and less dangerous to use. It involves the use of fairly large quantities of water and two spraying operations.

The cost of clearing by the use of chemicals, if the pear is at all thick, may run to £4 per acre. Since grazing land free from pear can be purchased at £4 per acre, it is often cheaper to buy land free from pear than to clear it if heavily infested.

The operation of injecting is best carried out with an injector or a stabber. Atomising and spraying are best carried out with specialised implements that are on the market. Through the action of the Queensland Prickly Pear Land Commission, atomisers were reduced (in that State) from £8 to £5 10s. each, and pear stabbers from £4 to £1 10s. each.*

The conclusion that Dr. Jean White arrived at in 1916 after four years' work on pear poisons was that: "For poisoning prickly-pear by either injection or the spray method, there is no doubt that arsenic pentoxide is superior to all other chemicals." It has three great advantages in that—(1) It travels when once introduced into a plant to the extremities; (2) it is soluble in water; and (3) it is not dangerous to handle. It is generally produced by oxidising ordinary arsenic with nitric acid and heating to a red heat. In 1916, on account of the war, its price was prohibitive. In 1924 the cost landed in Brisbane was 7¾d. per lb. In 1925 the cost was 6d. per lb. It is mixed with three to four times its weight of water for use. If used as an injection on any kind of pear, the result is certain. If used as a spray on tough, old plants, the external layer of the pear does not admit of uniform penetration, and the results are not so satisfactory.

In 1918, O. G. Roberts patented a specific containing 20 per cent. of arsenic pentoxide and 80 per cent. of concentrated sulphuric acid. The acid, when sprayed on the pear, injures or destroys the protecting epidermis, and allows the poisonous arsenic pentoxide to penetrate the tissues. After extended negotiations, the Queensland Commission have contracted for the delivery of this pear poison in drums at a little over 4d. per lb.

By the Employment of Natural Enemies.—The Travelling Commission ascertained that in India and Ceylon *O. monocantha* was in many cases killed by a cochineal insect, *Coccus indicus*, and in South Africa a related insect, *Coccus confusus capensis*, was found. Segments of pear with both insects were sent to Queensland. The insects could be induced to feed on no other plant than *O. monocantha*. *Coccus indicus* was liberated at Charters Towers and other places, and has practically wiped out *O. monocantha*, upon which its effect is extremely marked. This opuntia is not a serious pest, and this insect will attack no other species.

One would hesitate about bringing any insect, animal, or plant from another country into Australia after our experience with the rabbit, the starling, and St. John's Wort. In their native country these organisms

* Descriptions of implements and poisons will be found in the reports (two) of the Queensland Prickly Pear Land Commission and the Report of the Department of Lands, New South Wales, 1926. Costs have been greatly reduced as a result of the efforts of these bodies.

have their own enemies that keep them in check, and in regard to parasites, great as is the harm that they may do, it must be borne in mind that the worst thing that can happen to a parasite is the death of its host, so that they usually kill slowly or not at all. There are a number of insects that appear to attack prickly-pear only, and their introduction has been undertaken. The objection that if they have not exterminated the pear in their own country they will not do so here is answered by the fact that in their own country they, too, are attacked by parasites or by natural enemies that keep them in check.

The success of *Coccus indicus* in destroying *O. monocantha* led to the idea that a similar coccus might be found to kill out *O. inermis*. No such coccus has been found. It has been sought, therefore, to introduce a number of insects which, acting in concert, may keep the pear in check. A number of insects in America that feed on prickly-pear have been tested out to see if they would attack any other plants. Of those tested, the following have been deemed safe to introduce into Australia:—*Melitara juncto-lineella*, *Mimorista flavidissimalis*, *Cactoblastis cactorum*, *Chelinidea tabulata*, and *Dactylopius tomentosus*. These have been sent over in adapted Wardian cases, bred up free from parasites and liberated.

Three strains of *Dactylopius tomentosus* have been imported into Australia and acclimatised. Two were imported by the Prickly Pear Board from Texas and Arizona respectively, and one from Chico, California, independently of the Board. This importation was made by the late Mr. Temple Clerk, a man who had devoted time and money to the study of prickly-pear. He received little thanks or honor. It is a matter for congratulation that the cochineal which he imported from Chico was free from parasites. It has been distributed and has proved very destructive of *O. inermis.*

Although Britton and Rose include *O. stricta* and *O. inermis* as the one species, Mr. Alexander, who was till recently in charge of the prickly-pear investigation, does not agree. He retains the name *O. inermis* for the pest pear of New South Wales, and the name *O. stricta* for the Gayndah pear of Queensland, which has hitherto been regarded as *O. dillenii,* as classified by Maiden. Keeping Alexander's names, we find that the three strains of the cochineal-like insect, *Dactylopius tomentosus*, behave, speaking broadly, as follows:—

	O. inermis.	*O. stricta.*
Clerk's strain from Chico ...	Destructive.	Fairly destructive.
Texas strain	Little injury.	Destructive.
Arizona strain	Destructive.	Destructive.

Destructive Caterpillars.

The following caterpillars tunnel into prickly-pear pads and so destroy them:—

Melitara junctolineella.—Caterpillar dark blue with light bands. Larva solitary; passage dirty, *i.e.*, the debris of the caterpillar is discharged inside the pad on which it is feeding. Pear swells where attacked. Bores from

one segment to another. Two generations a year. The eggs of the moth are joined together in a lineal manner, and look like a tiny stick. Twelve eggs in a stick; moth lays six sticks. Moth about ¾ of an inch long, grey in colour.

Memorista flavidissimalis.—Small white caterpillars; eat very young growth only. Liberated in four places, established perhaps in one. Moth small, yellow in colour.

Cactoblastis cactorum.—Breed three times a year, increases 100 times in two generations. Eat inside of the pads. The caterpillars work in groups and do good work. Bright orange red with black stripes. Moth grey with silver markings about ¾ of an inch long. Egg sticks, eighty eggs per stick. Passage clear, *i.e.*, the debris of the caterpillars is discharged outside the pear pad upon which they are feeding. Egg stage, twenty-one days; caterpillar stage, thirty days; pupa stage, twenty-one days, approximately.

Other Destructive Organisms.

Red Spider.—A very minute spider, *Tetrarhynchus* sp., eats surface around areoles. Accidentally introduced. Same morphologically as the red spiders now here, but it apparently attacks *only* prickly-pear, while the red spider now here attacks other plants, but *not* prickly-pear. Destroys the epidermis, and the resultant production of cork causes weakness or death to the plant. Appears to work most effectively in conjunction with *Dactylopius tomentosus.*

Chelinidia tabulata.—A flat bug of moderate size. Is well established and multiplies rapidly. Punctures the leaf and the fruit, which latter it causes to fall prematurely.

The natural enemy of *Dactylopius* is a native lady-bird (*Cryptolaemus mountrouzieri*), the white floury-looking grub of which preys upon it. These are present at Dulacca and other places.

As previously pointed out, the centre from which prickly-pear is said to have spread in New South Wales is Scone. A Dr. Carlisle took thither, about 1839, a rare plant in a pot. About 1870 it was recognised that the prickly-pear in the district had got beyond control. The present area infested with pear is about 23,000,000 acres, or, in round figures, 34,000 square miles, an area greater than that of the whole State of Tasmania, and as it is said to be spreading at the rate of a million acres per year, it seems doubtful whether these noxious insects can ever catch it up. In four years *Dactylopius* has spread from the centre where it was liberated about 20 miles. They have not been established long enough in the open to gauge their rate of spread and their ultimate effect. On 11th April, 1924, the following appeared in a section of the Brisbane press:—

"Within our grip; Prickly Pear Pest; Menace overcome. In the course of time the prickly-pear which has become a fast-growing menace and a decided pest, will be annihilated. This, in effect, is the well considered

opinion of Sir George Knibbs, Chairman of the Commonwealth Prickly Pear Board, which held a meeting in Brisbane yesterday. Sir George Knibbs reassured our representative, in an interview yesterday, that the Board has the pest within its grip. 'Through poisoning?' he was asked. 'No, through biological treatment' was the reply."

The comment of the Queensland Prickly Pear Land Commission, Mr. W. L. Payne, Chairman, in their report issued June, 1925, was, *inter alia:* "Why continue to battle arduously with the pear if this were actually true? . . . On 7th April, 1925, the same authority was reported in the Brisbane press as having made a comparison between poisoning and biological methods to the detriment of the former. The published remarks would seem to indicate imperfect knowledge as to what is being done in Queensland. Many other statements misleading to the public have been made, from time to time, by persons claiming knowledge of biological matters."

To cope with prickly-pear is a stupendous problem. It is not the only plant problem that confronts Australia. I am of opinion that St. John's Wort, the blackberry, Saffron thistle, and other introduced plants are going to prove tremendous problems also, and their eradication or control will need the sober thoughts of earnest men. So far as the work of insects on prickly-pear has gone, it may be said that they attack and destroy young plants, and that they help to break down the density of old pear. So far they have done their best work in the hotter climates.

Fungi attack prickly-pear under certain conditions. Pear in the district of Harrison Inlet, N.S.W., where the rainfall is great and the soil sandy, has been found to suffer from the attack of a species of Fusarium. Transfers of this to pear in a drier district have not been successful. A fungus, *Gloeosporium lunatum* (the perfect form of which is *Sphaerella opuntiæ*) has been found on pear in New South Wales. It has been obtained in pure culture, and when inoculated into pear pads has been effective in their destruction. The conditions necessary for the rapid development and spread of fungi are so special that I do not expect they will form a very effective means of controlling prickly-pear. Not only does *O. inermis* not dry up when cut or injured, but it forms on the exposed surface a dry felt-like layer of dark colour which seems to have properties inhibitive to most fungus growth. A bacillus (*Bacillus cacticidus* Jnstn. and Hitchcock) was found in South Florida which destroyed prickly-pear. It would not itself infect pear segments, but had to be injected into them, and when so injected it would not spread from pad to pad. It was found to attack the fruits of Cucurbitaceae. It has not been liberated in Australia.

The conclusion to be arrived at is that we must not wait for insects to become effective, but must destroy now, at every opportunity, scattered pear of every species by mechanical means or by poisoning before it is too late. If left it will assuredly get out of hand and become too expensive to destroy by chemical means or by mechanical means.

The Percolation of Water in Soils and its Relation to Irrigation.

ERIC S. WEST, M.Sc., Research Officer, Commonwealth Citrus Research Station, Griffith.

THE type of farming and the methods in vogue in any place may be said to be dependent upon three main factors or groups of factors, *viz.*, soil, climate, and economic conditions. If we disregard the last very important group, then the climate is the chief influence under dry farming, especially where economic conditions are such that extensive methods are employed. Among the climatic factors, the rainfall is by far the most important in any given region, and so much is this the case that it is often possible to predict the agricultural practices of a locality. For example, the line of 10-inch winter rainfall marks the western limit of wheat-growing in New South Wales.* Under irrigation, however, the rainfall is of minor importance, since the plants are not dependent upon this source for their water supply, and soil conditions assume the rank of greatest importance. The type of farming practised under irrigation is dependent mainly upon this factor and a soil map will very closely indicate the type of crops which may be grown.

Where irrigation is practised the soil is called upon to absorb anything from 2 to 6 acre-inches per acre or, at times, even greater amounts than this during a single irrigation, whereas, under dry conditions the soil seldom receives such large amounts of water, a fall of even 3 inches being phenomenal and leading to floods. It is only to be expected then that the large applications of water made under irrigation should create problems more or less foreign to the dry farmer, and it is these problems related to the soil which become the most important under irrigation.

Soil Moisture.

Water exists in the soil in three different states:—

(i) *Hygroscopic Water.*—Although a soil may appear quite dry it always contains a certain amount of water, known as "hygroscopic" water, which can be driven off by heating the soil to 100 deg. Cent., that is to say, the boiling-point of water, and this hygroscopic water may constitute as much as 10 per cent. of the air-dry weight of the soil. If a soil has been depleted of its hygroscopic water by heating, it will re-absorb moisture from the atmosphere when exposed.

* H. A. Smith, *Agricultural Gazette*, N.S.W., Vol. XXXV, page 1.

(ii) *Capillary Water.*—Water also exists in the soil as capillary water which represents that fraction of the water content which is held by capillary force and does not drain away. If water is added to soil in a flower pot a certain amount drains away, but after this action has ceased, the soil will on examination be found to be moist and the water so held is called the capillary water.

(iii) *Free or Gravity Water.*—A soil which only holds capillary water still has a large amount of air space between its particles capable of being filled with water, but this water would not be retained by a properly drained soil. So that fraction which drains through the bottom of the flower pot is known as the free or gravity water of the soil.

The Water Table.

When a large amount of water is added to the surface of land, the interstices in the soil become filled, so that at first, near the surface, it contains so much gravity water in addition to the capillary water, that it may be described as being water-logged. This free water is, however, not retained near the surface, but percolates at a greater or less rate depending upon the texture of the soil, saturating successive layers in its descent until it either all becomes absorbed by the soil as capillary water, or until it comes to some impervious stratum such as bedrock, where it collects to form the water table of the soil. This water table is usually found at some considerable depth in the soil, though it varies from quite close to the surface to several hundred feet depending upon the geological structure, rainfall, and other conditions pertaining to the locality.

If a shaft is sunk into the soil sufficiently far to penetrate the water table, the gravity water will be seen to ooze out of the saturated soil until the level of the water in the shaft becomes adjusted to the surface level of the water table. Thus it will be seen that striking water in a well really means penetrating the water table of the soil. Where the water table for any reason comes near to the surface, a spring occurs, and is known as a surface spring—not uncommon in hilly country.

Effect of a High Water Table.

If large quantities of water are added to the soil, the water table will rise owing to the addition of gravity water, and it is this which constitutes one of the greatest dangers attending the indiscreet use of water. There are cases for example where the water table has been known to rise from the increasing gravity water supplied under irrigation, from a depth of 100 feet or more to the surface, and for the rise to be followed by very serious results.

Roots of plants will penetrate almost any soil, and even rocks, in search of water; in fact, it is quite common for roots to disrupt massive rocks by their growth. On the other hand, free water is a most effective obstacle to

the growth of most roots, from which it will be seen that the water table effectively limits their downward penetration, restricting the feeding zone of the plants and making them very susceptible to drought. A normal citrus tree has the great bulk of its feeding roots in the surface soil, but it also possesses large roots penetrating deeply into the subsoil, which perform a very important function in tiding the tree over short periods of drought. Although the tree obtains most of its mineral plant-food and water through its great mass of surface roots, it is dependent upon those roots which have penetrated deeply for its water supply when the surface soil becomes dried out.

Restricted Root Development of an Orange Tree Resultant on a High Water Table.

The absorptive action of the root is most active when the water content of the soil stands at about half that found in the saturated soil, and this degree of saturation is known as the optimum water content of the soil for plant growth. When the soil contains more water than this optimum amount, that is to say, contains much free gravity water, the roots of plants suffer from insufficient air supply and absorption is consequently decreased. When, on the other hand, the soil contains less than the optimum, the water in the soil is held more tenaciously and is not easily absorbed by the plant.

The surface soil is always subject to much greater fluctuations of water content and temperature changes than the lower layers; after a heavy irrigation or rain it becomes water-logged, but soon dries, passing relatively quickly through the stage of optimum water content and becoming

comparatively dry, thus being a good medium for absorption for only a comparatively short period. It is during the periods when the surface soil becomes too dry for the surface roots to absorb sufficient water to keep pace with the evaporation from the foliage that the plant is dependent upon its deeply penetrating roots to keep it from wilting. Thus, it may be said that they act somewhat in the nature of a fly-wheel, carrying a plant over the droughty periods.

If we follow the growth of a tree in soil in which the water table is, say, within 12 inches of the surface, we will find that it grows rapidly for the first few years owing to the ever-present supply of water close at hand; the roots of the plant, however, will only develop in the first foot of soil, so that when the tree becomes fully grown it usually suffers from drought and succumbs during some hot, dry spell.

In practice, it is found to be almost impossible to keep the first foot of soil at all times at a proper water content. After an irrigation it is saturated and is a poor medium for absorption, and within a very short period a similar condition obtains owing to it having dried out. If, therefore, a tree has developed a surface-rooting habit, it is extremely difficult, and at times impossible, to keep it properly supplied with water, the very frequent irrigations necessary only aggravating the trouble, since they serve to keep the water table near the surface. It will be seen, therefore, that it is most important to avoid over-irrigation, particularly when a tree is young.

If the water table is constantly at a depth of, say, 6 feet from the surface, it is beneficial, inasmuch as the roots will grow down to it, and since the soil above it is kept continually moist by the capillary rise of water from the water table, the plant has a permanent and ever-present supply and will thrive at all times irrespective of any added water in the form of rain or irrigation. Should, however, the water table rise from a 6 feet depth to a depth of, say, 4 feet, after the roots have become established under the former condition, the roots from 4 feet to 6 feet will be drowned owing to the saturated condition and the absence of air, and this will have very serious effects upon the tree, causing wilting with the advent of hot weather. In such a case the tree will not as a rule completely succumb, but its foliage and several of the main branches will die, after which fresh shoots will appear. This is in the nature of self pruning, the tree adjusting its foliage to its root development in the same way as a horticulturist planting out a nursery tree cuts back much of the top growth to balance reduced root system.

It will be seen then how great is the danger from a rise in the water table after the tree has become established. If the water table was at a depth of 4 feet when the tree was planted and remained at this depth, the tree would adapt itself to such a condition and would grow quite normally and no harm would result. Of course, if the water table is permanently too close to the surface as, for example, say, 2 feet, the roots of the tree

will be correspondingly restricted, and it will be impossible to obtain a large, healthy, drought-resistant tree—a set of conditions which may at first sight appear anomalous—too much water leading to drought conditions.

When the roots of trees are killed by the rise of the water table or, in fact, in any other way, as for example by burrowing animals or disease organisms, the foliage dies in a very characteristic manner, the leaves remaining quite green and normal until the first hot spell (which may be several months after the damage has occurred to the roots) when they will suddenly wilt and die. It will often be observed that only one or perhaps two branches die, the rest remaining green and healthy. In such cases it

Effect of Water-logged Soil Conditions on a Peach Tree.
The roots corresponding to the dead branches have been killed by excess of water in the soil.

will be found that the main roots corresponding to the withered boughs have been killed, the other roots remaining healthy and able to supply the corresponding boughs with necessary water.

The Percolation of Water in Soil.

If a hole is dug in the soil and then filled in again, the soil being rammed with a crowbar, it will be found that the hole is not completely filled by the soil, although the soil may have appeared quite compact and even required the use of a crowbar to remove it. The reason for this is that the soil in its natural state is not one solid, homogeneous mass, but is riddled by small tunnels, the result of worm burrows, decayed roots,

cracks, etc., which may be observed in the side of the hole if such is carefully examined. Close examination of a stream of water slowly advancing down an irrigation furrow will disclose the fact that quite appreciable amounts flow into cracks and other small openings, which seem to have remarkable capacities for absorbing water. At the Commonwealth Citrus Research Station water has been observed to flow from tile drains placed 4 feet deep in a heavy soil, within half an hour of the application of water to the surface of the soil. In this case the water undoubtedly found its way through crevices, which illustrates the method in which water percolates through the soil.*

Water percolating through the soil, then, finds its way downward mainly through these large cracks and crevices and, in fact, were it not for these, percolation in a heavy soil would be extremely slow. Of course, as the water passes downward it soaks into the finer interstices of the soil more or less completely filling them up, and bringing about a water-logged condition.

There are then two ways in which water moves through soil, through small channels when it will be under appreciable hydrostatic pressure, and through the finer interstices when the greater friction encountered serves to mask the effect of this pressure. Observation of a hole that has been sunk into the soil and penetrating the water table, will disclose that much of the water that enters the hole oozes in from the sides coming from the finer interstices, but it will often be noticed also that water spurts in from one or more places quite rapidly, being under appreciable hydrostatic pressure. This water comes from the small crevices. Percolation downward is mainly through the crevices and small channels, while the capillary rise takes place only by way of the finer interstices.

In soil that has been irrigated, or on which much rain has recently fallen, the zone of saturation moves downward at a greater or less speed, dependent upon the texture of the soil, the downward movement being relatively fast in sandy soil but extremely slow in heavy, retentive clays. This zone of saturation is virtually a local water table occurring near the surface of the soil, and free water will appear in the hole sunk into it, the surface of the water corresponding to the surface of the zone in the same way as the surface of water that will collect in a hole sunk into a permanent water table. So long as this zone of saturation moves down reasonably fast, no harm will result, in fact such downward moving zones of saturation are even advantageous in helping to aerate the soil, since in moving downward they drag with them imprisoned air, thus assisting in the circulation of the soil atmosphere. For this and for other reasons, the roots of plants are rather tolerant of a saturated soil, provided the water is in motion, whereas stagnant water is very harmful and is not tolerated by the plant for any length

* It must not be thought that water penetrates to such depths as quickly as this throughout the soil. Crevices large and deep enough to permit of percolation as rapid as that instanced, although they do exist, occur only here and there.

of time. If the zone of saturation descends too slowly, the local water table so produced may become quite as harmful as a true or permanent water table close to the surface, and just as dangerous.

If a wave of saturation is moving down at a depth of 6 feet from the surface in a fairly heavy soil and irrigation water is applied, another zone of saturation will be formed at the surface which will begin to descend slowly, thus giving two waves of saturation, both moving down, one near the surface and the other at a depth of 6 feet. Between these two zones the soil may be relatively dry, but a hole sunk into either of them will carry standing water. In heavy soils the capillary rise of water is fairly slow, and it is quite possible for the soil to be saturated at a depth of 5 feet, quite dry at a depth of 3 feet, and saturated again at the surface.

With periodic irrigations, therefore, successive waves of saturation are formed which slowly percolate down through the soil. In heavy soils at the lower depths these zones may more or less merge, so that the successive waves will lose their identity. This may occur perhap at 5 or 6 feet, where it will be possible to obtain free water at all times. Should the irrigations be too frequent on such a soil the waves will merge nearer the surface and free water will be continually found at this point.

Judicious Irrigation.

This opens up a very important question for consideration—the correct method of irrigating heavy soils. If such soils are irrigated frequently the water table so produced close to the surface will limit the root development of trees, and they will be very liable to drought, but irrigating at long intervals as the surface soil dries out will cause the trees to send down their roots, following the downward movement of the wave of saturation.

It is therefore important to pay great attention to the irrigation of heavy soils, for on such soils the surface 6 or 12 inches may be dry, but the soil may be saturated at a depth of 2 or 3 feet. Water should not be added under such conditions, even though the trees show signs of distress. In other words, on heavy soils water should be held off as long as possible, thus encouraging a deep rooting habit of the tree.*

Under these conditions trees will not grow so fast as they would with a plentiful supply of water close to the surface, but they will build up a deep and well established root system and be drought-resistant, and, in the case of citrus, be more or less permanent, whereas if they have been over-irrigated while young they will probably die out during some hot spell when twelve or fifteen years of age. It will be found also that when the roots have once penetrated into the deeper soil the water will percolate more easily to the lower layers, the roots having assisted in opening up the soil.

* These remarks do not apply to young trees which have just been planted, since during the first summer such trees need to be very carefully nursed, and should at all times be well supplied with water, but once they are established a deep rooting system should be encouraged.

As pointed out earlier practically no soil in a proper moisture condition is impenetrable by plant roots, but saturated soil is a very effective barrier to root growth, and, therefore, allowing a wave of saturation to fall to a reasonable depth below the surface before irrigating a second time will permit the establishment by the plant of a deep-rooting habit. It is thus an advantage for trees in heavy soils to be more or less starved for water during their early growth, as this alone encourages the development of deep roots.

In deciding when to irrigate, the farmer should be guided by the moisture condition of the subsoil as well as of the surface soil, and this necessitates the examination of the soil to some depth, for which purpose a soil auger is particularly useful. Such an instrument may be constructed by filing off the worm at the tip of an ordinary 1½-inch auger and welding on to it a longer shank, making the instrument about 5 feet long The water table should at all times be very carefully watched, and this is best done by the construction of "test wells" made by sinking a hole 5 to 6 feet deep and 2½ inches in diameter by means of a soil auger and introducing therein a length of 2-inch down pipe perforated with holes about 1 inch apart. If a few of these test wells are constructed over the field it is a very simple matter to determine the position of the local water table in the soil in their vicinity at all times, it being only necessary to poke a long stick down the well to determine the height of the water therein. They can be made with very little labour and expense, and the amount of information they yield and its importance justifies their construction; they should be installed on all irrigated orchards.

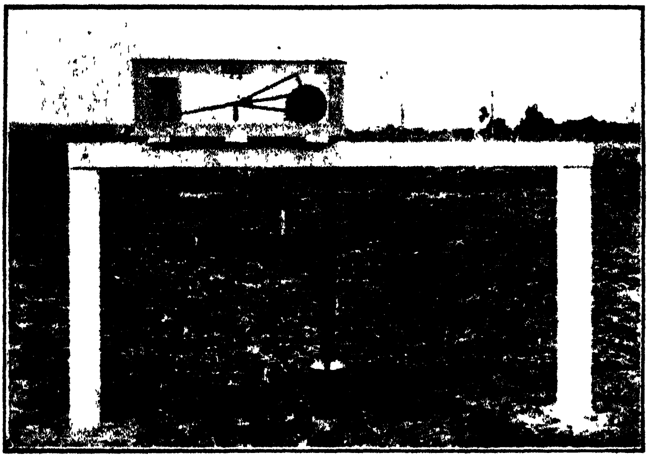
A Method of Determining the Height of the Water Table by means of Test Wells.

Besides its direct damage to the growing tree, a high water table is dangerous in so far as it may give rise to accumulation of soluble salts at the surface of the soil. If the water table is so high that water will rise by capillarity to the surface, salt will quickly accumulate where the water evaporates. The safe limit for the water table varies, of course, with the texture of the soil. In light, sandy soils the water rises by capillarity very rapidly, and the water table should be kept at least 6 feet or more below the surface, while in heavy soils, on the other hand, the capillary rise is much slower and no accumulation of salt may result even with the water table as close as 3 feet to the surface. Nevertheless, even in heavy soils, free water

should not be allowed to remain for long periods closer than 4 feet from the surface and a greater depth is preferable. In this connection it should be pointed out that heavy soils have a far greater water-holding capacity than light soils and plants do not require such a large zone for root development as in light sandy soils, so that 3 feet of the former class of soil may be sufficient for the development of a large tree, whreas a tree of the same size would require 6 feet or even 8 feet of the latter class.

The water table can be controlled by judicious irrigation, attention to surface drainage, or by the improvement of the under drainage.

If irrigations are too frequent especially with respect to heavy soils the waves of saturation will merge into one another comparatively near the



A Self-registering Test Well which continuously records on a Revolving Graph the height of the Water Table.

It consists essentially of a test well 4 inches in diameter containing a float, the rising and falling of which moves a pen across the graph By means of this instrument the rate at which the water table rises and falls can be determined

surface where a local water table will be formed. By irrigating at longer intervals, on the other hand, the zones of saturation will not merge until a greater depth is reached. It should also be borne in mind that excessive irrigations may in time bring the permanent water table close to the surface.

Attention to Surface Drainage.

It is often possible to lessen the danger of the formation of a local water table close to the surface or to prevent the rise of the permanent water table by proper attention to surface drainage, more particularly on heavy land. If the surface drainage is poor, heavy winter rains may be sufficient to bring about a water-logged condition of the surface soil, and the same results may follow irrigations if one part of the orchard receives too much water which cannot be drained away.

Improving the Under-drainage.

By the construction of underground drains the water table can be effectively controlled, and when there is danger either from a high local water table or a high permanent water table, this is the most effective and sometimes the only means of removing the menace. The best type of under drains are tile drains, which are constructed by excavating a trench to the required depth and placing agricultural tiles therein, end to end, after which the trench is filled in. The tiles are cylindrical earthenware pipes 1 foot long varying in diameter according to requirements, a convenient size being 4 inches internal diameter, but where large amounts of water have to be removed the diameter of the tile may have to be increased. The design of the tile drain system should be very carefully worked out, preferably by a qualified engineer. The bottom of the trenches must be excavated to the correct grade regardless of the contour of the surface so that the tiles may be given a correct grade of their own and may consequently vary in depth from the surface according to the fluctuations of the contour. The pipes are placed end to end, but the joints are not closed in any way and the action is as follows:—When the soil is saturated, water percolates in through the cracks between the tiles in exactly the same way as it oozes into the hole sunk into the water table, and this water is quickly removed by the drain. The effect of the tile drains therefore is to deplete the soil in their vicinity of its free or gravity water, thus allowing the wave of saturation to move down more rapidly in the vicinity of the tiles. The surface of the water table in the soil tends to become level in the same way as the surface of the water in a lake, the only difference being that in the soil the movement of the gravity water is impeded by the soil particles, and is consequently slow, so that the gravity water of the soil takes some time to adjust itself to a level surface. When, therefore, the water table in the vicinity of the tiles is lowered the gravity water in the soil between the tile drains moves towards the drains with a slow lateral movement, and this continues until the surface of the entire water table is lowered to the depth of the drain.

It will thus be seen that tile drains not only lower the water table to their level, but accelerate the downward movement of the wave of saturation, which is very beneficial in helping the aeration of the soil and providing movement of the water for, as previously mentioned, the roots of trees are more tolerant to saturated soil when the water is moving at an appreciable rate.

Experience goes to show that tile drains do more than this, in so far as they tend in time to open up heavy and intractable soils. Small channels are washed out in the vicinity of the drains which gradually increase in size, and in time help very materially in the drainage of the soil. Again, by becoming successively wet and dry the structure of the soil improves.

In a well-tilled fertile soil, the clay particles form little aggregates which give the soil an open "crumb structure," making it more permeable to water, giving it a greater air space and generally improving its fertility.

The soil is then said to have a good "structure." Judicious cultivation and other agencies such as alternate wetting and drying help to bring about this condition in the soil. Cultivating when too wet, or keeping the soil in a continual state of saturation, breaks down these aggregates, and the soil is then described as being puddled. The potter desires this puddled condition which he brings about by kneading the clay, and such a condition is also required in the clay at the bottom of an excavated tank in order to make it impervious. In an agricultural soil, however, the crumb structure is desired, and the tile drains, by quickly drying the soil, help in producing such a state, whereas the continual saturation of an undrained wet soil tends toward a puddled condition.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner.	Address.	Breed.	Number tested.	Expiry date of this certification
Walter Burke	Bellefaire Stud Farm, Appin.	Jersey..	36	19 March, 1927.
Department of Education .	Gosford Farm Homes	....	32	16 April, 1927.
H. W. Burton Bradley .	Sherwood Farm, Moorland.	Jersey..	71	21 May, 1927.
William Thompson Masonic Schools.	Baulkham Hills ..	. ..	33	15 June, 1927.
Department of Education .	Mittagong Farm Homes.	.	33	7 July, 1927.
Hygienic Dairy Company .	Glenfield Farm, Casula, Liverpool.	. .	113	15 Aug., 1927.
Lunacy Department .	Morisset Mental Hospital.	.	14	18 Oct., 1927.
Department of Education .	May Villa Homes ..	.. ...	6	3 Nov., 1927.
Do do .	Eastwood Home ..	....	10	3 Nov., 1927.
Do do ..	Hurlstone Agricultural High School.	....	47	4 Nov., 1927.
Lunacy Department ..	Rydalmere Mental Hospital.	.. ..	61	23 Nov., 1927.
A. E Collins...	Hazelhurst Dairy, Bowral.		10	6 Dec., 1927.
Miss Brennan	Arrankamp, Bowral	.. .	27	7 Dec., 1927.
Lunacy Department ..	Callan Park Mental Hospital.	...	26	15 Dec., 1927.
Department of Education .	Yanco Agricultural High School.	. .	26	12 Jan., 1928.
A. V. Chaffey .. .	"Lilydale," Glen Innes.	....	15	25 Jan., 1928.
Lunacy Department ...	Kenmore Mental Hospital.	.....	99	1 Feb., 1928.
Walaroi College	Orange	.....	2	3 Feb., 1928.
Lunacy Department ...	Orange Mental Hospital.	.	3	7 Feb., 1928.
Australian Missionary College.	Cooranbong	.	51	11 Feb., 1928.

—MAX HENRY, Chief Veterinary Surgeon.

Early Tomatoes in the Metropolitan Area.

J. DOUGLASS, H.D.A., Agricultural Instructor.

[Concluded from page 335.]

Irrigation.

WITH the advent of warm weather the crop grows quickly, and with fine weather irrigation commences. The source of the water is the Sydney water supply, the cost being 1s. per 1,000 gallons. The amount of water used on the 2 acres was 400,000 gallons, or £20 worth. As 22,000 gallons are equal to 1 acre inch, this consumption of water is equivalent to under 9 inches of rain. Considering up to Christmas last season was very dry, this consumption is not excessive.

The irrigation system used is very simple and cheap to construct. It consists of a main 2-inch pipe line, along which at intervals of a chain are cocks. An adjustable ½-inch pipe can be placed at, or connected by means of a rubber pipe to any of these cocks. This adjustable pipe can be disconnected and shifted when required. It consists of eight pieces 30 feet in length, joined by rubber tubing, which is permanently bound on one side by wire and temporarily twitched by rope on the other. This makes a rather crude but effective connection and can be easily disjointed.

Every 15 feet along this pipe is fitted a half-inch rubber tubing, 15 feet long, at the end of which is a butterfly spray. The end is supported on a tripod, 6 feet high, made of three stakes. This butterfly spray (there are sixteen in the set) is capable of throwing water in a 24-feet circle. At the end of an hour to an hour and a half, according to the condition of the soil (in which time it is estimated that equivalent to 1½ inches of rain has been distributed), these sprays can be shifted to the other side of the pipe line. Thus two areas can be sprayed without the 2-inch pipe being interfered with or moved. By this system about a quarter of an acre can be irrigated at once. The only disadvantage of the system is that the ripening fruit are sometimes cracked, but as the quality and prices are very high, the defect is of little importance.

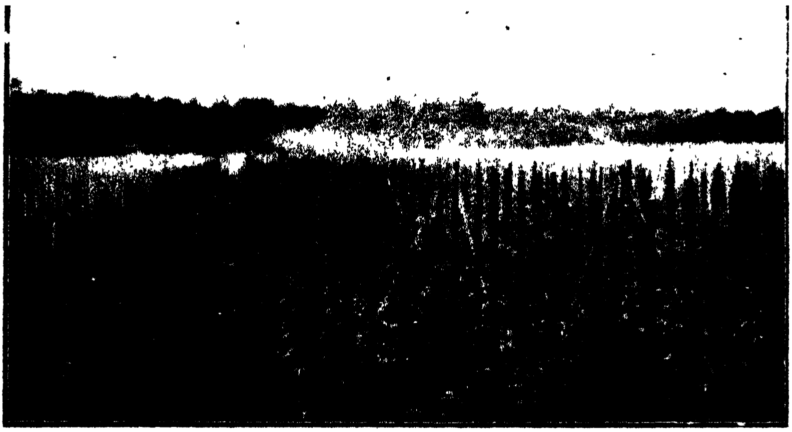
Pruning.

Judicious pruning is carried out from the early stages until the plants reach the top of the stake. Pruning consists of nipping out all lateral growth, thus forcing the fruit to be borne on a single stem. The lateral growth always occurs between the leaf stalk and the main stem. At each pruning it is the usual practice to tie the plant to the stake with 3-ply seaming twine. This operation is carried out about eight times during the growing period. After the first two prunings a man can prune and tie 1,000 plants per day. When the plants have reached the top of the stake the growing point is nipped out, if possible, above a bunch of flowers. The object of

pruning is to force the fruit to early maturity and to increase the size and percentage of marketable fruit. The system ensures that the quality of the fruit is uniformly good right to the top bunches. Pruning also permits the free passage of air, thus reducing the risk of disease.

Pollination.

Tomatoes grown out of season usually show a tendency to poor pollination of the flowers. The first bunches of Mr. Johnson's early crop were not as good or complete as the following ones, but when compared with other crops the setting was exceptionally good. Strict attention is given to the pruning, feeding, and watering of the crop, hence the plants have every chance of setting fruit. As the first bunches are the most valuable, a small test is going to be carried out next year in hand pollination, with the object of obtaining a more perfect setting.



The Method of Irrigation adopted by Mr. Johnson.
Overhead spraying; Sydney city water supply.

Harvest.

The writer inspected this crop on 1st November and noticed odd fruit coloured and fit to pick, but it was not until 3rd November that a consignment was placed on the market. From the end of November onward the fruit ripened rapidly and extra labour had to be put on to cope with the rush. In the first, second, and third bunches the fruit was uniform in size and very large. Individual specimens weighing up to 1½ lb. were common. The large fruit were the cause of the only complaint received from the buyers; with tomatoes at 1s. 6d. per lb. wholesale it can be readily seen that very large tomatoes are not in demand.

As the crop is despatched direct to Sydney by motor-lorry, the fruit can profitably be allowed to ripen on the vines, as little damage can be done during such a short journey. The quality and flavour of fruit ripened on the vine is the best and commands the highest price.

Grading and Packing.

Great care is exercised by this grower in grading and packing. The system of packing depends on the size of the fruit, large ones being packed two rows deep and medium ones three rows deep. The slightly damaged and small fruit, which are placed on the market early in the season, being all shapes and sizes, are not packed on any system.

The following are the grades in which the tomatoes are placed on the market:—

Ripe (2 rows), medium ripe (2 rows), coloured (2 rows).
Ripe (3 rows), medium ripe (3 rows), coloured (3 rows).

A General View of the Vines during December.
The fruit was of high quality.

Half-bushel cases of the hinged type (usually known as "grape" cases) are used to pack the tomatoes in, and the weight of fruit conveniently packed in each averages 24 lb.

½ bushel of 2-row grade contains from 43 to 50 tomatoes.
½ bushel of 3-row grade contains from 120 to 135 tomatoes.

Diseases and Pests.

The amount of loss due to diseases, pests, and mechanical injuries did not amount to 1 per cent. in the 1926-27 crop. The sterilisation of the mulch used in the seed-bed accounts for the absence of insect pests in the frames. From the earliest stages the seedlings are sprayed regularly with a weak solution of Bordeaux mixture, 1-1-20 being the strength used. It

is found the plants are injured if a stronger solution is employed. After the plants have been removed to the field the regular sprayings are discontinued.

The most prevalent disease is spotted wilt, but as soon as a diseased plant is noticed it is pulled up and removed from the field and the empty space is immediately replanted with a healthy seedling. As this disease is spread by insects, an insecticide is used rather than a fungicide, the practice being to apply nicotine sulphate.

1. 2. 3.

A Heavy Setting of Fruit—the Result of Good Cultural Methods.

Variety.—Selection by Mr. Johnson from Spark's Earliana.

1. Photo taken 1st November, 1926. Note the setting of early fruit.
2. Photo taken 1st December, 1926. Note the quality of the fruit, some of the lower branches have been partly picked.
3. Photo taken in January, 1927. Note the quality and setting of fruit on the top of the plant.

Slight evidence of septoria was also noticed through the crop last season.

The insect pests were more troublesome than usual, cutworms, vegetable weevil, and Rutherglen bugs doing most damage. The last named insect came in plague form late in the season, and threatened to destroy the

remaining fruit until they were disturbed by a spraying with nicotine sulphate. A small infestation of aphis early in the season was also controlled by this spray.

Varieties under Departmental Test.

After testing out several varieties of tomatoes this grower finally selected Earliana as the most suitable for the early crop. Two strains were selected —Sparks' and Sunnybrook. From these two strains selections have been made, and it was from such seed that the last record crop was grown.

Mr. Johnson co-operated with the Department of Agriculture last season in testing out his own selections of Earliana against Departmental selections of the same and other varieties. The varieties under trial are named in the accompanying tables. These varieties all received the same treatment as the main crop seedlings, and the returns from each, in crop, and in value are shown in the tables.

VARIETY Trial.

Area of Plots—One-twentieth acre.

Weight of Crop.

	Sparks' Earliana. (A. J. bulk sel.)		Sunnybrook Earliana. (A. J. bulk sel.)		Bonny Best.		John Baer x Earliana.		Jas. Harris' Sel. Earliana.		J. R. Ricelo's Earliana.		Ralph Moore Earliana.		Hoffman's Earliest.		Sunnybrook Earliana. (Special plant sel. by A.J.).	
	case	lb	case	lb	case	lb	case	lb	case	lb	case	lb	case	lb	case	lb	case	lb
Harvested to Nov., 1926.	9	8	9	20	8	18	7	22	7	2	7	4	8	12	4	12	15	12
,, ,, Dec., 1926. .	34	6	38	16	43	18	37	4	36	4	34	8	34	14	37	4	40	14
,, ,, Jan., 1927. .	23	12	25	10	26	0	18	2	19	20	23	16	17	16	22	0	24	18
Total Harvested ..	67	2	73	22	78	12	63	4	63	2	65	4	60	18	63	16	80	20

*Monthly Valuation of Crop.**

	Sparks' Earliana. (A. J. bulk sel.)			Sunnybrook Earliana. (A. J. bulk sel.)			Bonny Best.			John Baer x Earliana.			Jas. Harris' Sel. Earliana.			J. R. Ricelo's Earliana.			Ralph Moore Earliana.			Hoffman's Earliest.			Sunnybrook Earliana. (Special plant sel. by A.J.).		
	£	s.	d.	£	s.	d.	£	s.	d	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Value, November, 1926 ...	9	16	0	10	6	6	9	3	9	8	6	3	7	8	9	7	10	6	8	18	6	4	14	6	16	5	6
,, December, 1926 ...	38	10	7	43	10	0	49	18	4	41	16	3	40	13	9	38	12	6	38	18	1	41	16	3	45	13	1
,, January, 1927 ..	10	7	8	11	3	1	11	9	4	7	19	9	8	15	4	10	9	2	7	16	2	9	14	4	10	18	5
Total Value (Gross) ...	58	14	3	64	19	7	70	11	5	58	2	3	56	17	10	56	12	2	55	12	9	56	5	1	72	17	0

* Average price of top grade per case per month was :—November, 21s.; December, 22s. 6d.; January, 8s. 10d.

Sparks' Earliana.—This plot was grown from a bulk selection of seed saved by Mr. Johnson. The foliage is very scanty; fruit, of good shape,

excellent flavour, and being very firm is a good carrier and keeper. This strain is not as early or quite such a heavy yielder as Sunnybrook. The first fruit was picked on 13th November.

Sunnybrook Earliana.—Compared with Sparks', this strain of Earliana is earlier and heavier in yield. Foliage fairly heavy, giving some protection from sunscald in latter stages of growth; good quality fruit, although general shape not as perfect or as uniform as Sparks'. This strain is the best selection under test.

Bonny Best.—This is the most promising Government variety under test. Although slightly later (seven days) than the Sparks' strain, this variety proved to be a heavy yielder. An outstanding feature was the uniformity of the bunches and quality and shape of individual fruit. Although reputed to have a strong constitution, it took black spot rather badly; leaves fairly heavy.

Hoffman's Earliest.—Germination of this seed was faulty; an Earliana type, which responds well to the single-stem system; bunches very long; fruit medium in size, but of good shape and quality.

J. R. Ricelo's Earliana.—One of the best Earlianas under test; good yielder with smooth, deep, well-shaped fruit.

John Baer x *Earliana.*—Fairly strong grower, early, setting good bunches; fruit smooth, medium in size, very good quality.

Jas. Harris' Selection Earliana.—Fairly good yielder; first fruit ripened 17th November.

Ralph Moore Earliana.—Yielded very well in early stages, and a little better than results would indicate; fruit large, smooth, and of very good quality.

The highest prices are usually obtained from the earliest fruit harvested, but this year's market was peculiar in that the highest prices were realised during the end of December. A survey of the returns shows that the highest price realised during November was on 3rd, when 30s. was obtained; the average for the month was 21s. On 22nd December 40s. was obtained for six cases; average price for the month was 22s. 6d. The average price for January was 8s. 10d.

The true relative values of the varieties can be obtained by examining the yield table. The monetary returns are valuable for this year only, as the prices do not represent the average of a number of years, and peak prices did not occur when normally expected.

The following figures give the returns for Mr. Johnson's 2-acre crop, including the experiments. The present writer examined all returns, which went through the agents, and was also in a position to check nearly all the

expenses. These figures are given more as an indication of what can be done, rather than as a typical example of the returns from tomato production.

Sent to agents	2,083	cases
Sold locally	155	„
Total	2,238	„

		£ s. d.
Total gross value		1,637 13 6
Commission	£118 7 9	
Case hire	52 1 6	
Cartage	43 7 11	
Fertiliser	20 2 6	
Water	20 0 0	
Labour	150 10 0	
		404 9 8
Profit		£1,233 3 10

No allowance has been made for interest, depreciation, and ground rent, but as they would be very low in each case, their inclusion would not greatly alter the figures.

Poisonous Plants and Sheep.

Poisonous plants play a large part in mortalities amongst sheep. There is much yet to be learnt regarding the poisonous properties of many of our grasses and herbage plants. In plants containing prussic acid, the amount of that acid varies at different stages of growth and periods of the year. The poisonous properties of certain plants also vary considerably in different parts of the plant, and with the time of the year. As a general rule, the most dangerous period is during the time when the plant is flowering and seeding. A number of plants, which probably contain small quantities of poison throughout the year, only become dangerous at flowering period. An important factor to be considered is how hungry the sheep are when brought on to pasture containing poisonous plants.—H. G. Belschner, District Veterinary Officer, Orange, at Grenfell Bureau Conference.

Infectious Diseases Reported in March.

The following outbreaks of the more important infectious diseases were reported during the month of March, 1927:—

Anthrax	2
Pleuro-pneumonia contagiosa	6
Piroplasmosis (tick fever)	Nil.
Blackleg	4
Swine fever	11

—Max Henry, Chief Veterinary Surgeon.

Egg-laying Tests at Hawkesbury Agricultural College.

(Under the Supervision of James Hadlington, Poultry Expert.)

Twenty-fifth Year's Results, 1926-27

F. H. HARVEY, Acting Organising Secretary.

The Twenty-fifth Egg-laying Competition at Hawkesbury Agricultural College commenced on 10th April, 1926, and terminated on 31st March, 1927, a period of 356 days. The reason for opening the competition on 10th April is that the interval between the 1st and the 10th makes it possible to remove from the pens the birds in the last competition and to place the new entrants in their pens without an intermediate change.

The competition was controlled by a committee of management, comprising four officers of the Department of Agriculture and three competitors' representatives, namely, the College Principal (Mr. E. A. Southee), Messrs. James Hadlington (Poultry Expert, Department of Agriculture), C. Lawrence (Poultry Instructor, Hawkesbury Agricultural College), C. Judson, J. H. Madrers, and L. A. Ellis (competitors' representatives), and C. E. Houghton (Department of Agriculture), Organising Secretary. Mr. Madrers died during the year, and was succeeded on the Committee by Mr. C. M. Larsen, who had been runner-up in the election for competitors' representatives. The Committee desires to pay a tribute to the enthusiasm at all times displayed by Mr. Madrers in his duties concerning the competition, and his interest in the poultry industry generally.

Scope of the Competition.

The competition embraced the usual four sections, was limited to pullets between seven and twelve months old on 9th April, 1926, and pens were allotted as follows:—

	Groups.	Birds.
Section A.		
Open Light Breeds:—		
White Leghorns ...	51	306
Section B.		
Open Heavy Breeds:—		
Black Orpingtons ..	23	138
Langshans ...	5	30
Plymouth Rocks .	1	6
Section C1.		
Standard Light Breeds:—		
White Leghorns ...	4	24
Brown Leghorns ...	1	6
Section C2.		
Standard Heavy Breeds:—		
Black Orpingtons ...	2	12
Langshans	2	12
Columbian Wyandottes	1	6
Totals	90	540

Weight of Eggs.

The regulation that individual hens must lay eggs of at least 2 oz. each, and that eggs from groups must average at least 24 oz. per dozen within four months of the commencement of the competition in order to be eligible for prizes, resulted in the disqualification of eleven individual hens and three groups, as follows :—

Disqualified from Individual Prizes.

Light Breeds.—Anderson Bros. (No. 192), H. Battersby (Nos. 201 and 202), M. and A. McInnes (No. 374), A. Mobbs (No. 395),

Heavy Breeds.—S. C. Zealey (No. 31), Grassmere Poultry Farm (No. 46), C. F. Cummings (No. 52), A. H. Moxey (No. 97), Woodlands Poultry Farm (Nos. 136 and 137).

Disqualified from Group Prizes.

Light Breeds.—Anderson Bros., H. Battersby.

Heavy Breeds.—Woodlands Poultry Farm.

The Financial Aspect.

The quantities of feed consumed by the 540 birds were as follows :—

Wheat ...	320 bushels	24 lb.	Salt	229 lb.	13 oz
Maize	171 ,,	36 ,,	Shell grit	1 ton	4 cwt.
Pollard ...	723 ,,	10 ,,	Green feed	82 cwt.	
Bran	361 ,,	15 ,,	Epsom salts... ...	51 lb.	
Meat meal... ...	12 cwt.	24 ,,			

The total cost of the foodstuffs was £296 18s 7d., equal to 11s. per head.

Calculated at Sydney ruling market prices for new laid eggs, the value of the eggs laid in the competition was £780 8s. 10d., equal to a net price of 1s. 8½d. per dozen.

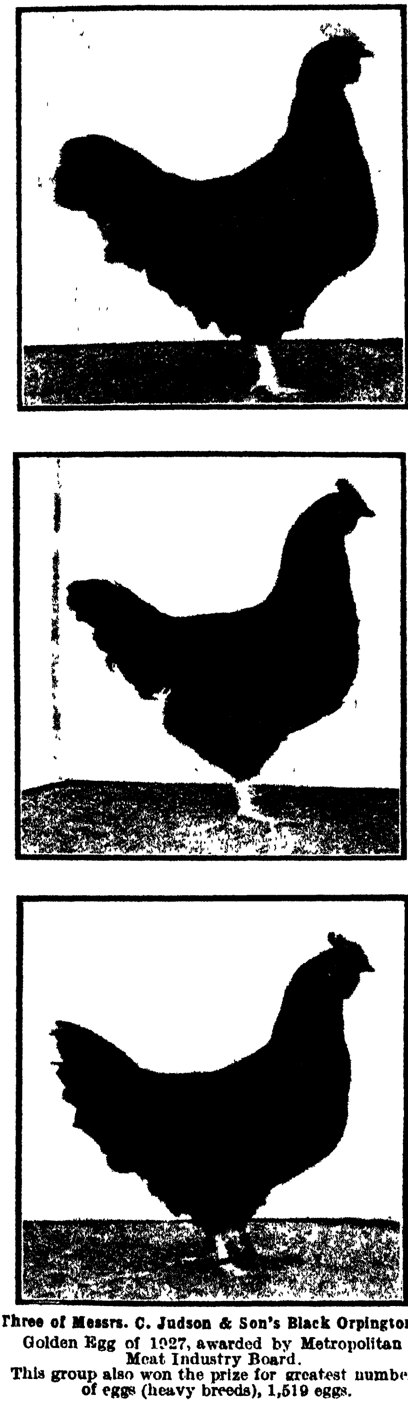
Averages of Breeds.

No. of Birds	Breed.	Eggs per Hen.	Weight of eggs per dozen.	Value per Hen.
		Open Light Breeds.	oz.	£ s. d
306	White Leghorn	209	25¼	1 9 4
		Open Heavy Breeds		
138	Black Orpington	207	24½	1 9 7
30	Langshan	195	25	1 7 10
6	Plymouth Rock	178	26	1 5 5
		Standard Light Breeds.		
24	White Leghorn	161	25	1 1 11
6	Brown Leghorn	220	24½	1 10 9
		Standard Heavy Breeds		
12	Black Orpington	195	25	1 7 9
12	Langshan	217	25¼	1 11 1
6	Columbian Wyandottes ...	191	24¼	1 6 3

Three of Mr. M. C. Byrne's White Leghorns.

Grand Champion Prize for laying eggs of greatest market value, £11 0s. 7d.

This group also won the prize for the greatest number of eggs (light breeds), 1,452 eggs.



Three of Messrs. C. Judson & Son's Black Orpingtons.

Golden Egg of 1927, awarded by Metropolitan Meat Industry Board.

This group also won the prize for greatest number of eggs (heavy breeds), 1,519 eggs.

Annual Competition.

Full details of the financial and other results since the inception of the competition are given in the following comparative table:—

	No. of Groups.	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Average Net Price of Eggs.	Average Value per Hen.	Cost of Feed per Hen.	Balance over Feed.
1st ...	38	1,113	459	137	130	1/1	15/6	6/-	9/6
2nd ...	70	1,308	666	160	163	1/3¾	17/9	5/9¾	12/-
3rd ...	100	1,224	532	154	152	1/-	12/9	4/5½	8/3
4th ...	100	1,411	635	168	166	-/11½	13/3	5/3½	8/-
5th ...	100	1,481	721	162	171	1/0½	14/10	5/10	9/-
6th ...	60	1,474	665	161	173	1/2¼	17/2	7/-	10/2
7th ...	50	1,379	656	159	180	1/3¼	19/2	7/9½	11/4
8th ...	60	1,394	739	158	181	1/5¼	21/9	6/9	15/-
9th ...	40	1,321	658	151	168	1/2	16/3½	6/5½	10/2
10th ...	50	1,389	687	146	184	1/2½	18/5½	6/1½	12/4
11th ...	50	1,461	603	156	178	1/3½	19/4¼	7/3½	12/0¾
12th ...	50	1,360	724	152	177	1/2½	17/7	5/9	11/10
13th ...	63	1,541	705	162	181	1/2	17/8½	6/9½	10/11
14th ...	70	1,449	506	165	192	1/4½	22/2	7/7	14/7
15th A	40	1,526	924	162	216	1/3¾	28/8¾	6/10	16/10¾
15th B	30	1,479	749	165	192	1/3¾	21/7½	6/10	14/9½
16th A	40	1,525	923	157	209	1/4	21/9¾	7/8	14/1¾
16th B	30	1,613	931	170	202	1/4	21/2	7/8	13/6
17th A	40	1,448	860	153	199	1/5½	22/0½	7/10	14/2½
17th B	30	1,517	815	151	189	1/5½	21/11¼	7/10	14/1¼
18th A	30	1,438	988	148	203	1/10	28/10	9/3	19/7
18th B	50	1,428	745	151	190	1/10	28/1	9/3	18/10
18th C1	3	1,304	977	138	195	1/10	27/8	9/3	18/5
18th C2	7	1,336	955	150	191	1/10	28/5	9/3	19/2
19th A	33	1,516	996	167	206	2/2	37/11	12/8	25/3
19th B	47	1,488	955	168	204	2/2	37/11	12/8	25/3
19th C1	5	1,425	944	148	195	2/2	36/-	12/8	23/4
19th C2	5	1,298	1,020	150	193	2/2	35/9	12/8	23/1
20th A	45	1,480	881	157	196	1/11	30/10	11/9	19/1
20th B	35	1,457	696	160	192	1/11	31/2	11/9	19/5
20th C1	5	1,092	885	144	168	1/11	24/7	11/9	12/10
20th C2	5	1,370	1,092	147	197	1/11	33/5	11/9	21/8
21st A	50	1,425	646	164	195	1/9	28/5	10/10	17/7
21st B	30	1,417	720	164	188	1/9	27/5	10/10	16/7
21st C1	5	1,220	864	149	176	1/9	25/8	10/10	14/10
21st C2	5	1,212	931	144	187	1/9	27/3	10/10	16/5
22nd A	50	1,508	942	161	210	1/6	26/3	9/9	16/6
22nd B	30	1,600	871	164	203	1/6	26/3	9/9	16/6
22nd C1	5	1,307	692	142	170	1/6	21/1	9/9	11/4
22nd C2	5	1,430	1,052	152	205	1/6	26/9	9/9	17/-
23rd A	57	1,470	961	160	212	1/8	28/7	9/11	18/8
23rd B	23	1,558	1,006	164	211	1/8	29/2	9/11	19/3
23rd C1	5	1,291	950	146	180	1/8	23/5	9/11	13/6
23rd C2	5	1,308	1,049	159	192	1/8	27/5	9/11	17/6
24th A	50	1,444	803	158	206	1/6	26/5	10/-	16/5
24th B	30	1,466	916	171	199	1/6	26/4	10/-	16/4
24th C1	5	1,248	881	136	187	1/6	25/-	10/-	15/-
24th C2	5	1,331	777	151	186	1/6	24/7	10/-	14/7
25th A	51	1,531	797	162	209	1/8½	29/4	11/-	18/4
25th B	29	1,519	753	161	204	1/8½	29/2	11/-	18/2
25th C1	5	1,319	1,092	147	173	1/8½	23/8	11/-	12/8
25th C2	5	1,326	842	155	203	1/8½	28/9	11/-	17/9

The Monthly Laying.

Month.		Section A. Open Light Breeds.		Section B. Open Heavy Breeds.		Section C1. Standard Light Breeds.		Section C2. Standard Heavy Breeds.		Total.
		Total for 306 hens.	Average per hen.	Total for 174 hens.	Average per hen.	Total for 30 hens.	Average per hen.	Total for 30 hens.	Average per hen.	
April,	1926	2,390	7·8	1,543	8·9	172	5·7	151	5 0	4,256
May,	,,	4,047	13·2	2,502	14·4	195	6·5	458	15·3	7,202
June,	,,	5,176	16·9	3,479	20·0	360	12·0	524	17·5	9,539
July,	,,	5,923	19·4	3,762	21·6	451	15·0	631	21·0	10,767
August,	,,	6,308	20·6	3,977	22·9	515	17·2	633	21·1	11,433
September,	,,	6,800	22·2	3,889	22·4	589	19·6	669	22·3	11,947
October,	,,	7,110	23·2	3,710	21·3	638	21·3	634	21·1	12,092
November,	,,	6,360	20·8	2,938	16·9	553	18·4	543	18·1	10,394
December,	,,	6,189	20·2	2,776	16·0	531	17·7	492	16·4	9,988
January,	1927	5,224	17·1	2,431	14·3	455	15·2	493	16·4	8,603
February,	,,	4,535	14·8	2,264	13·0	413	13·8	415	13·8	7,627
March,	,,	3,902	12·7	2,210	12·7	310	10·3	447	14·9	6,869
Total	...	63,964	209	35,481	204	5,182	172·7	6,090	203	110,717

Weights of Winning Birds.

The following are the weights of the winning birds at the beginning and end of the competition:—

		Weight at April, 1926.		Weight at March, 1927.	
Groups.		lb.	oz.	lb	oz.
Light Breeds— M. C. Byrne's White Leghorns, Nos...	229	3	10	4	0
	230	3	10	2	12
	231	3	12	3	14
	232	3	8	3	8
	233	3	12	3	14
	234	3	12	4	4
Heavy Breeds— Judson and Son's Black Orpingtons Nos.	67	6	2	6	4
	68	5	4	5	8
	69	6	12	5	12
	70	5	8	6	4
	71	8	0	8	8
	72	5	4	5	8
Individual Hens.					
Light Breeds— S. F. Codling's White Leghorn, No. 270 ...		3	10	3	12
Heavy Breeds— A. R. Wheatley's Black Orpington No. 123		5	6	5	0

PRIZE LIST.

Grand Champion Prize.

A prize of £5 5s., awarded by the Department of Agriculture, for group laying eggs of greatest market value, without replacement of a bird :—M. C. Byrne's White Leghorns; market value, £11 0s. 7d.

Golden Egg of 1927.

A special prize (value £25), awarded by Metropolitan Meat Industry Board for group of six birds to be judged on number, quality, and market value of eggs, also standard quality of the birds :—C. Judson and Son, Black Orpingtons, 1,519 eggs; market value, £10 17s. 5d.

SPECIAL PRIZES.

The W. H. PAINE special prize of £10 10s. (donated by Mr. W. H. Paine, of Metropolitan Meat Industry Board), for leading group opposite to winner of golden egg of 1927, to be awarded on same basis as that prize:—W. T. Wimble's White Leghorns, 1,452 eggs; market value, £10 9s. 5d.

JUDSON PRIZE (donated by C. Judson & Son) for first individual hen to lay 200 eggs in the Competition.—A. R. Wheatley, Black Orpington, £2 2s. (200 eggs in 210 days).

MADRERS PRIZE (donated by Mrs. J. H. Madrers), for greatest individual consecutive score.—T. McDonald, Black Orpington, £2 2s. (95 eggs laid 20th September to 23rd December, 1926).

THE HADLINGTON AND ELLIS PRIZES (donated by Messrs. J. Hadlington and E. A. Ellis) of £2 2s. each for groups in Heavy or Light Breeds making a record for Quarterly Test, were not awarded, as no group exceed previous records.

GREATEST NUMBER OF EGGS (GROUPS OF SIX BIRDS).

Light Breeds.—M. C. Byrne (White Leghorns), 1,531 eggs, £3; F. T. Wimble (White Leghorns), 1,452 eggs, £2 10s.; Watson and Stepney (White Leghorns), 1,428 eggs, £2; I. Lowery (White Leghorns), 1,425 eggs, £1 10s.; A. Greentree (White Leghorns) 1,417 eggs, £1.

Heavy Breeds.—C. Judson and Son (Black Orpingtons), 1,519 eggs, £3; Mrs. V. Cox (Black Orpingtons), 1,425 eggs, £2 10s.; Mrs. J. H. Madrers (Black Orpingtons), 1,417 eggs, £2; F. C. Nicholls (Langshans), 1,410 eggs, £1 10s.; J. Buckle (Black Orpingtons), 1,382 eggs, £1.

INDIVIDUAL HENS.

Light Breeds.—S. F. Cooling (White Leghorns), 294 eggs, £2 10s.; G. H. Mann (White Leghorns), 287 eggs, £2; F. T. Wimble (White Leghorns), 273 eggs, £1 10s.; R. G. Christie and Son (White Leghorns), 272 eggs, £1.

Heavy Breeds. A. R. Wheatley (Black Orpingtons), 331 eggs, £2 10s.; Mrs. J. H. Madrers (Black Orpingtons), 299 eggs, £2; Mrs. J. H. Madrers (Black Orpingtons), 288 eggs, £1 10s.; C. Judson and Son (Black Orpingtons), 284 eggs, £1.

QUALITY PRIZES.

Open to competition amongst groups in open sections selected for conformation most closely to standard type.

Light Breeds.—F. T. Wimble (White Leghorns), 1,452 eggs, £5; Watson and Stepney (White Leghorns), 1,428 eggs, £2 10s.

Heavy Breeds.—C. Judson and Son (Black Orpingtons), 1,519 eggs, £5, F. C. Nicholls (Langshans), 1,410 eggs, £2 10s.

Open to birds in standard sections, awarded on egg yields.

Light Breeds.—Turner Bros. (Brown Leghorns), 1,319 eggs, £2; A. Benson (White Leghorns), 1,184 eggs, £1.

Heavy Breeds.—W. Townsend (Langshans), 1,326 eggs, £2, H. Eldershaw (Langshans), 1,283 eggs, £1.

QUARTERLY PRIZES.

Winter test (9th April to 30th June, 1926):—

Light Breeds.—M. C. Byrne (White Leghorns), 323 eggs, £2, F. T. Wimble (White Leghorns), 319 eggs, £1 10s.

Heavy Breeds.—Mrs. J. H. Madrers (Black Orpingtons), 372 eggs, £2; A. R. Wheatley (Black Orpington), 356 eggs, £1 10s.

Spring test (1st July to 30th September, 1926):—

Light Breeds.—G. T. Stirton (White Leghorns), 431 eggs, £1 10s.; G. N. Mann (White Leghorns), 424 eggs, £1.

Heavy Breeds.—A. R. Wheatley (Black Orpingtons), 462 eggs, £1 10s.; C. Judson and Son (Black Orpingtons), 461 eggs, £1.

Summer test (1st October to 31st December, 1926):—

Light Breeds.—Bide-a-Wee Poultry Farm (White Leghorns), 467 eggs, £1 10s.; E. T. Rhodes (White Leghorns), 433 eggs, £1.

Heavy Breeds.—C. Judson and Son (Black Orpingtons), 410 eggs, £1 10s.; T. McDonald Black Orpingtons), 406 eggs, £1.

Autumn test (1st January to 31st March, 1927):—

Light Breeds. L. Piper (White Leghorns), 363 eggs, £2; Turner Bros. (Brown Leghorns), 361 eggs, £1 10s.

Heavy Breeds.—T. McDonald (Black Orpingtons), 361 eggs, £2; C. Judson and Son (Black Orpingtons), 332 eggs, £1 10s.

HIGHEST AVERAGE PRIZES. OPEN TO GROUPS OF FIVE OR SIX BIRDS.

Light Breeds.—M. C. Byrne (White Leghorns), 255 eggs, £3; R. G. Christie and Son (White Leghorns), 243 eggs, £2 10s.; F. T. Wimble (White Leghorns), 242 eggs, £2; Watson and Stepney (White Leghorns), 238 eggs, £1 10s.

Heavy Breeds.—C. Judson and Son (Black Orpingtons), 253 eggs, £3; J. Buckle (Black Orpingtons), 243 eggs, £2 10s.; Mrs. J. H. Madrers (Black Orpingtons), 241 eggs, £2, Mrs. V. Cox (Black Orpingtons), 238 eggs, £1 10s.

EGG-YIELDS OF EACH BIRD AND GROUP IN THE TWENTY-FIFTH ANNUAL COMPETITION.

Owner and Breed.	Totals of Individual Hens.						Totals of Groups.	Weight of Eggs per dozen.	Market Value of Eggs.		
Open Section Heavy Breeds.								oz	£	s	d
C. Judson & Son: Black Orpingtons	217	270	257	284	234	257	1,519	25¾	10	17	5
Mrs V. Cox: Black Orpingtons ...	271	257	195	246	179	277	1,425	25¼	10	2	4
Mrs J. H. Madrers: Black Orpingtons	242	144	299	231	*213	288	1,417	24½	10	7	2
F. C. Nicholls: Langshans	231	*219	251	249	213	247	1,410	25¼	10	5	0
J. Buckle: Black Orpingtons ..	*168	252	271	276	190	225	1,382	26¼	9	19	9
A. R. Wheatley: Black Orpingtons	*201	282	331	189	201	*156	1,360	25	9	18	3
T. McDonald: Black Orpingtons .	200	212	209	248	229	246	1,344	25½	9	4	2
Woodlands Poultry Farm: Black Orpingtons.	250	194	266	‡157	‡205	247	1,319	‡23¾	9	9	4
C. F. Cummings: Black Orpingtons	247	*167	226	‡270	179	202	1,291	24¼	9	5	3
A. E. Ross: Langshans	224	274	227	185	163	177	1,250	25¼	8	14	3
C. B. Knight: Black Orpingtons ...	243	260	*162	258	100	226	1,249	25¾	8	16	9
E. C. Lunn & Son: Black Orpingtons	209	178	206	188	212	251	1,244	26	8	19	10
F. W. Button: Black Orpingtons ...	256	176	221	239	†93	241	1,226	25½	8	16	3
W. H. Luxton: Langshans. ..	190	244	172	176	216	226	1,224	24¾	8	14	6
Grasmere Poultry Farm: Black Orpingtons.	253	204	115	‡194	234	218	1,218	24¼	8	14	4
W. Griffin: Langshans	208	272	190	187	201	152	1,210	24½	8	13	10
H. Bird: Black Orpingtons ..	223	*177	185	239	197	184	1,205	24¾	8	12	10
S. C. Zealey: Black Orpingtons ..	‡241	211	230	138	150	207	1,180	24¾	8	12	6
S. A. Clarke: Black Orpingtons ..	194	153	200	191	215	225	1,178	25¾	8	4	5
A. George: Black Orpingtons ...	179	253	* 91	239	167	247	1,176	25¼	8	10	2
W. W. Tennent: Black Orpingtons	229	202	255	98	182	208	1,174	25¼	8	12	2
A. H. Moxey: Black Orpingtons ...	‡212	*108	253	189	178	231	1,171	24¾	8	10	2
J. W. Smiles: Black Orpingtons ..	159	218	214	156	179	214	1,140	25	8	2	9
F. G. Sims: Black Orpingtons .	98	237	243	239	89	221	1,127	24	8	2	8
M. & H. Williamson: Black Orpington	170	129	212	210	202	161	1,084	25	7	16	2
J. D. Martin: Plymouth Rocks .	232	†198	158	203	*128	148	1,067	26	7	12	9
C. M. Larsen: Black Orpingtons ...	144	†159	238	*147	161	208	1,057	24¼	7	9	7
F. J. Masters: Black Orpingtons ...	222	185	*114	111	204	202	1,038	24¾	7	0	0
J. Every: Langshans . .	83	*97	168	125	110	170	753	25	5	6	5
Open Section Light Breeds.											
M. C. Byrne: White Leghorns ...	251	251	252	252	260	265	1,531	25	11	0	7
F. T. Wimble: White Leghorns ...	249	273	227	240	255	208	1,452	25¾	10	9	5
Watson & Stepney: White Leghorns	235	241	233	237	253	229	1,428	25	10	3	5
I. Lowery: White Leghorns ...	216	264	265	260	241	179	1,425	24½	10	2	4
Alf Greentree: White Leghorns ...	238	259	252	242	210	216	1,417	24¾	10	0	4
R. G. Christie & Son: White Leghorns.	*194	253	284	250	207	272	1,410	25¼	10	0	10

* Signifies bird dead or withdrawn and score retained.
† Signifies bird replaced and previous score struck out.
‡ Signifies eggs are under the prescribed weight of 2 oz.

EGG-YIELDS OF EACH BIRD AND GROUP IN THE TWENTY-FIFTH ANNUAL COMPETITION—*continued.*

Owner and Breed.	Totals of Individual Hens.						Totals of Groups.	Weight of Eggs per dozen.	Market Value of Eggs.
Open Section Light Breeds—continued.								oz.	£ s. d.
D. Asher: White Leghorns ...	178	262	230	256	251	230	1,407	24¾	9 18 7
G. T. Stirton: White Leghorns ...	223	208	233	267	221	228	1,380	25¼	9 12 10
G. N. Mann: White Leghorns ...	246	232	287	200	170	229	1,364	25	9 12 5
F. T. Turner: White Leghorns ..	234	224	184	231	236	245	1,354	25¾	9 11 8
H. Cole: White Leghorns	280	243	223	230	198	229	1,353	25¼	9 8 2
K. G. Cobcroft: White Leghorns ...	198	230	251	224	185	264	1,352	24¾	9 8 5
L. Piper: White Leghorns	250	213	237	194	‡240	212	1,346	24¼	9 8 0
E. F. Goldsmith: White Leghorns	271	253	162	188	221	248	1,343	24½	9 11 1
Parkhill Poultry Farm: White Leghorns.	255	219	227	250	223	166	1,340	26	9 8 8
E. T. Rhodes: White Leghorns ...	233	229	†246	194	241	197	1,340	25½	9 8 8
H. W. Jones: White Leghorns ...	239	222	217	252	179	226	1,335	25	9 11 11
Anderson Bros.: White Leghorns ...	183	176	225	235	239	268	1,326	‡23½	9 6 1
Hilder Bros.: White Leghorns ...	200	226	227	223	239	204	1,319	25¼	9 6 1
A. Hughes: White Leghorns ...	214	216	155	221	250	262	1,318	25¾	9 8 7
H. C. Bailey: White Leghorns ...	245	211	198	239	155	247	1,295	26	9 0 0
W. E. Strickland: White Leghorns	152	246	249	158	232	241	1,278	25¼	9 5 9
W. Hunt: White Leghorns ...	†125	266	239	257	220	167	1,274	26	9 0 11
J. R. Sellers: White Leghorns ...	173	250	262	198	196	194	1,273	26¼	9 2 2
H. P. Christie: White Leghorns ...	222	225	183	*189	205	242	1,266	24½	8 18 3
W. G. Hosking: White Leghorns .	197	183	228	269	224	164	1,265	25	8 13 11
Bide-a-Wee Poultry Farm: White Leghorns.	226	200	240	236	147	214	1,263	25½	8 8 1
J. Paton: White Leghorns	166	227	172	224	243	230	1,262	25½	8 18 7
B. Clarke: White Leghorns	255	219	196	237	*97	250	1,254	25¼	8 18 6
L. A. Ellis: White Leghorns ...	229	202	201	251	180	183	1,246	26¼	8 10 4
Escott Poultry Farm: White Leghorns.	205	232	221	219	136	220	1,233	24½	8 17 10
S. F. Cooling: White Leghorns ...	18	191	202	234	271	294	1,210	24¾	8 16 6
A. J. Williams: White Leghorns ..	185	248	150	246	209	154	1,192	25½	8 5 4
A. Mobbs: White Leghorns ...	200	150	202	214	232	‡191	1,189	24¼	8 2 2
G. H. Floyd: White Leghorns ...	242	†122	146	216	224	236	1,186	25½	8 1 7
T. E. Jarman: White Leghorns .	250	200	98	178	235	224	1,185	24½	8 4 2
A. W. Lewis: White Leghorns ...	240	135	214	228	†171	189	1,177	25½	8 1 8
Crear & Johnson: White Leghorns...	238	223	204	186	187	138	1,176	25¼	7 10 0
A. Campbell: White Leghorns ...	154	210	224	123	246	212	1,169	25¾	8 3 1
P. O. Ranch: White Leghorns ...	172	234	218	228	209	*101	1,162	26	8 2 1
H. L. Abrook: White Leghorns ...	218	135	219	245	†162	179	1,158	25	8 6 6
F. G. Lombe: White Leghorns ...	242	129	208	186	159	202	1,126	26	7 14 7
F. S. Longley: White Leghorns ...	*53	227	204	223	193	210	1,119	25½	7 18 10
E. H. Shipp: White Leghorns ..	239	*119	197	198	172	183	1,108	24¾	8 0 10
Lewis & Stephens. White Leghorns	*108	178	203	196	200	209	1,094	25½	7 10 6
M. & A. McInnes: White Leghorns	247	*‡76	196	178	154	232	1,083	24¼	7 16 0
Lee & Lenney. White Leghorns ...	112	187	260	221	195	107	1,082	25	7 10 6
F. A. Bailey: White Leghorns ...	219	137	217	105	206	†193	1,077	25	7 3 9
J. Westmacott: White Leghorns ...	*54	225	203	226	*112	234	1,054	25	7 9 8
Beltana Poultry Farm: White Leghorns.	214	172	208	119	177	152	1,042	27	7 3 11
H. Battersby. White Leghorns ...	190	140	‡28	*‡54	†178	207	797	‡23¾	5 1 3
Standard Section Heavy Breeds.									
W. Townsend: Langshans	224	221	250	174	206	251	1,326	25¾	9 9 5
H. Eldershaw: White Leghorns ..	208	180	235	231	229	200	1,283	25	9 3 7
J. L. Cole: Black Orpingtons ...	154	243	221	248	170	206	1,242	25½	8 14 2
F. O. French: Col. Wyandottes ...	167	159	221	176	204	220	1,147	24¼	7 17 8
W. M. Mulliner: Black Orpingtons...	260	194	168	130	159	181	1,092	24½	7 18 6
Standard Section Light Breeds.									
Turner Bros.: Brown Leghorns ..	219	197	211	268	213	211	1,319	24½	9 4 5
A. Benson: White Leghorns ...	187	214	218	246	200	*119	1,184	25¾	8 4 1
J. H. Hayes: White Leghorns ...	4	182	182	257	190	117	932	24¼	6 0 2
C. Emory: White Leghorns ...	140	179	137	159	150	140	905	25½	5 16 7
Cornwell: White Leghorns ...	*52	220	195	180	167	28	842	24¼	5 16 6

* Signifies bird dead or withdrawn and score retained.
† Signifies bird replaced and previous score struck out.
‡ Signifies eggs are under the prescribed weight of 2 oz.

Monthly Laying of Individual Prize Winners.

The following table shows the monthly laying of winners of the individual prizes for highest scores :—

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Total.
					Light Breeds.								
S. F. Cooling : White Leghorn	16	26	24	25	24	26	28	26	29	23	21	26	294
G. N Mann : White Leghorn	11	24	26	24	24	26	27	26	26	26	23	24	287
F. T. Wimble : White Leghorn . ..	14	23	23	25	25	28	27	25	26	26	25	6	273
R. G. Christie and Son : White Leghorn ..	8	14	22	23	23	25	29	26	27	27	25	23	272
					Heavy Breeds.								
A. R. Wheatley : Black Orpington	19	31	29	27	28	30	31	28	29	28	27	24	331
Mrs. J. H. Madrers : Black Orpington ..	18	26	24	22	28	26	29	27	26	25	22	26	209
Mrs. J. H. Madrers . Black Orpington .	17	27	26	13	31	29	28	27	29	15	22	24	288
C. Judson and Son : Black Orpington ..	16	21	25	25	28	26	28	26	16	25	23	25	284

Mr. Wheatley's bird was retained at the College in order to complete 365 days, and established a new college record of 338 eggs, beating the 337 eggs laid by C. Judson and Son's Black Orpington a few years ago.

Mortality and Disease.

The casualties, resulting from sickness and death, compared favorably with the previous year, being 37 as against 42, particulars being as follow :—

	1925-26.		1926-27.	
	Light Breeds.	Heavy Breeds.	Light Breeds.	Heavy Breeds.
Birds replaced	2	7	7	3
Birds not replaced	13	20	13	14

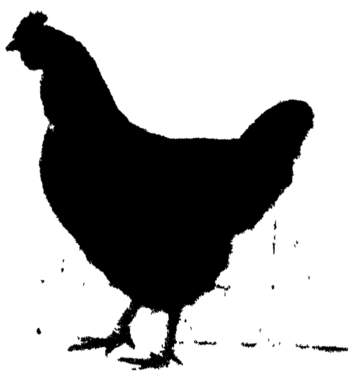
THE POULTRY EXPERT'S COMMENTS.

The most satisfactory feature of the competition is the higher general average per hen of 205 eggs, in comparison with 201 eggs last year.

A notable feature, too, is that the light breed section has produced the highest group tally. This is the first time since 1922 that White Leghorns have beaten Black Orpingtons. The next matter of interest is Mr. Wheatley's hen, which has beaten Messrs. Judson and Son's record hen for the 356 days,

completing the test. She had, however, to be kept for another nine days in order to complete the full year's performance, and in this she was also successful, laying 338 eggs in 365 days, and thus establishing a further record.

A close contest took place for the Metropolitan Meat Industry Board's trophy "The Golden Egg," value £25, which has been won by Messrs. Judson and Son's Black Orpington group; Mr. F. T. Wimble's White Leghorn group was a close runner up, losing by only half a point in eggs and 8s. in value. Mr. Wimble's group, however, won Mr. W. H. Paine's trophy, value £10 10s., for the best peformance in the opposite breed to the winner of the "Golden Egg," while Captain G. N. Mann was the runner-up to the winner of the W. H. Paine's trophy. It is noteworthy that each of the above groups secured the same points on breed quality, but the last two lost to Judsons on value and quality of eggs laid.



Mr. A. R. Wheatley's Black Orpington Hen.

This bird won the prize for the greatest number of eggs laid by an individual hen in the competition, laying 331 eggs Completing the 365 days in the pen, she established a College record by laying 338 eggs in twelve months

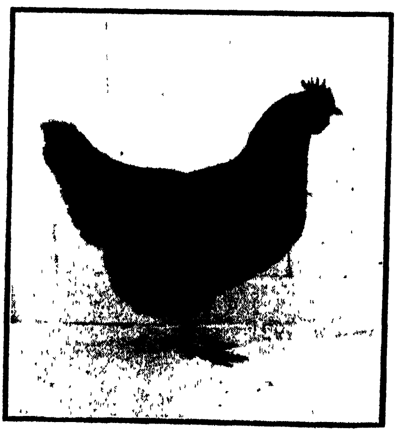
Except for these incidents, the competition progressed to the finish with less exciting interest than most of the Hawkesbury College tests. This was due to the fact that the leading group gradually moved up to top position over a period of many weeks. In addition to the top scoring, there were, as will be seen from the figures, quite a number of single birds which have put up meritorious performances, but there was no group but had been beaten previously.

The one disquieting feature in this test was a falling off in weight of eggs. Out of the ninety groups, only eleven reached 26 oz. and upwards to the dozen, whereas in the last test forty-one reached that weight. The average weight of eggs over the whole of the hens was also lower, the respective weights being 25½ and 25 ounces per dozen. To find a parallel for these low weights we have to go back to the years 1912 and 1913, since which up to this test average weights have ranged between 25½ and 27 ounces to the dozen. The last weight mentioned was in the 1921–22 test, the 1926 test being 25½. Seeing that there have been complaints during the past two years of a plethora of medium and small eggs on the market, this falling off in size of eggs in the competition is of some significance. It is to be hoped that this is a passing phase, because if it should prove a permanent factor it is

Three of Mr. F. T. Wimble's White Leghorns.

Special Prize for leading group opposite to winner of golden egg ; donated by Mr. W H Paine.

This group ran very close to the winners of the golden egg, losing by only half a point in eggs, and by 8s only in value.



One of Mrs. J. H. Madrer's group of Black Orpingtons.

time poultry farmers paid more attention to their breeding. It is feared that there is far too much in-and-in-breeding going on, loss of size in eggs being the inevitable result of this procedure. Farmers will do well to heed the warning, and particularly so since there is an ever increasing tendency to demand higher grading both for home consumption and export.

This is not the first time that the competition has shown some weakness to be appearing on the farms, and these signs of declining size should not go unheeded.

"A Treatise on Viticulture."

This comprehensive work of nearly 700 pages "is intended to be of service to both the student and the practical grower"—so we are informed in the preface. The author, Dr. I. A. Perold, Professor of Viticulture at the University of Stellenbosch, South Africa, grew up on a wine farm at Cape, and studied viticulture for two years in important wine countries in Europe and North Africa, so that his outlook should be a happy combination of the practice and the theory of his subject. The morphology and biology of the vine, and ampelography are presented in well-illustrated chapters, and the more practical matters of propagation, disease and pest control, nutrition, and cultivation, are each the subject of ample discussion from the grower's viewpoint. The handling of grapes with the secondary products also receives attention and contributes to an extensive work of a most useful character.

The material has been well handled by the printer, and the book makes an attractive and ample one.

Published by Macmillan & Co., Limited, London, from whom comes our copy.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1927.

Society and Secretary.		Date.	Society and Secretary.		Date.
Maclean (T. B. Notley)	May	11, 12	Lake Cargelligo	Aug.	31
Warialda	„	11, 12	Young	Sept.	6, 7, 8
Dungog (W. H. Green)	„	11, 12, 13	Gunnedah (M. C. Tweedie)	„	6, 7, 8
Coonamble (J. C. Wilson)	„	18, 19	Forbes (E. A. Austen)	„	6, 7
Narromine	„	18, 19	Ungarie	„	7
Ulmarra	„	18, 19	Ganmain (C. C. Henderson)	„	13, 14
East Gresford (C. K. Holden)	„	20, 21	West Wyalong	„	13, 14
Casino (P. W. W. Manson)	„	24, 25, 26	Cowra	„	13, 14
Trangie (A. K. Butler)	„	26, 27	Albury (A. G. Young)	„	13, 14, 15
Warren (R. H. Armstrong	June	1, 2	Murrumburrah	„	20, 21
Bonalbo (W. G. E. Johnston)	„	8, 9	Canowindra	„	20, 21
Peak Hill (T. Jackson)	July	26, 27	Temora	„	20, 21, 22
Tullamore (J. M. Robertson)	Aug.	3, 4	Boorowa	„	22, 23
Trundle (W. A. Long)	„	9, 10	Barellan	„	28
Condobolin J. M. Cooney)	„	16, 17	Barmedman	„	28
Illabo	„	17	Hillston	„	30
Wagga Wagga (F. H. Croaker)	Aug.	23, 24, 25	Ardlethan	Oct.	5
Bogan Gate (J. Egan)	„	24	Quandialla	„	5
Parkes (L. S. Seaborn)	„	30, 31	Narrandera M. F. Murray)	„	11, 12
Cootamundra	„	30, 31	Ariah Park	„	12
Grenfell	„	30, 31	Griffith	„	18, 19
Junee (G. W. Scrivener)	„	30, 31	Lismore (H. Pritchard)	Nov.	16, 17, 18.

"Butter Tables."

Butter factory managers and operatives are mostly familiar with the little booklet containing tables by which the amount of commercial butter obtainable from a given quantity of cream of various tests (from 20 per cent. to 60 per cent.) can be rapidly ascertained. The booklet has been out of print for some time, but it is now available again at 1s. Copies can be had from the Under Secretary, Department of Agriculture, Sydney, or from the Government Printer, Sydney.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Wheat—

Bena	J. Lyne, Downsfield, Yenda.
	W. Ash, Old Grenfell Road, Forbes.
	S. Kanaley, Junee.
	J. W. Wilson, Collie Road, Gilgandra.
Binya	Manager, Experiment Farm, Condobolin.
Canberra	Manager, Experiment Farm, Trangie.
	W. W. Watson, Woodbine, Tichborne.
	Quirk and Everett, Narrawa, Wellington.
	T. Jones, Birdwood, Forbes.
	Cullen Bros., Bunglegumbie, Dubbo.
	D. L. Miller, Glen Lossie, Daroobalgie.
	Manager, Experiment Farm, Condobolin.
Clarendon	J. W. Wilson, Collie Road, Gilgandra.
	Manager, Experiment Farm, Coonamble.
Cleveland	W. Burns, Goongirwarrie, Carcoar.
Currawa	W. Cameron, Heather Brae, Loomberah.
	Quirk and Everett, Narrawa, Wellington.
Federation	W. W. Watson, Woodbine, Tichborne.
	J. Lyne, Downsfield, Yenda.
	T. Jones, Birdwood, Forbes.
	D. L. Miller, Glen Lossie, Daroobalgie.
Firbank	Manager, Experiment Farm, Condobolin.
	Manager, Experiment Farm, Trangie.
Florence	T. R. Jones, "Birdwood," Forbes.
Gresley...	W. W Watson, Woodbine, Tichborne.
	J. W. Wilson, Collie Road, Gilgandra.
	D. L. Miller, Glen Lossie, Daroobalgie.
	Manager, Experiment Farm, Condobolin.
	T. R. Jones, "Birdwood," Forbes.
Hard Federation	Manager, Experiment Farm, Trangie.
Riverina	Cullen Bros., Bunglegumbie, Dubbo.
Turvey	D. Bolte, West Wyalong.
Wandilla	G. R. B. Williams, Gerelgambeth Ltd., Illabo.
	T. R. Jones, "Birdwood," Forbes.
Waratah	Manager, Experiment Farm, Trangie.
	W. W. Watson, Woodbine, Tichborne.
	G. R. B. Williams, Gerelgambeth Ltd., Illabo.
	J. W. Wilson, Collie Road, Gilgandra.

PURE SEED—*continued.*

Wheat—continued	
Yandilla King...	Cullen Bros., Bunglegumbie, Dubbo.
	D. L. Miller, Glen Lossie, Daroobalgie.
	T. R. Jones, "Birdwood," Forbes.
Oats—	
Gidgee	Manager, Experiment Farm, Trangie.
Mulga	Manager, Experiment Farm, Condobolin.
Barley—	
Trabut	J. W. Childs, Camden.
Field Peas—	
French Grey	Principal, H.A. College, Richmond.
Lima	Principal, H.A. College, Richmond.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

SHEEP REQUIRE A VARIETY OF FOOD.

LIKE all animals, sheep require a variety of food, so that the body may be supplied with a well-balanced ration. Too much of one class of food is a bad thing. On large holdings where sheep roam over thousands of acres, there is a greater variety of food, but in more closely settled areas, particularly on sheep and wheat farms, many owners are satisfied to turn their sheep into a paddock in which there is probably plenty of grass of a kind, and leave them there. When sickness occurs, they jump to the conclusion that some mysterious disease has broken out.—H. G. BELSCHNER, District Veterinary Officer, Orange.

WATCH THE VARIATION IN SEED WHEAT.

FARMERS should examine seed grain very carefully. In good seasons, when the grain is large and plump, there are not so many grains in a bushel of wheat as there are in a lean year, when the grain is smaller. A farmer must use discretion. If he wishes to sow a bushel of wheat to the acre, he should weigh it out and see that the drill puts that bushel of wheat on an acre of land—no more, no less. I have not yet found a drill accurate by the chart, nor will they sow two kinds of wheat alike. Each kind of wheat should be weighed. This also applies to superphosphate. Farmers using carbonate of copper should see that this powder does not accumulate in the sowing cups of the drill and cause slow running of the seed.—J. O'BRIEN, at Grenfell Bureau Conference.

CULTIVATION OF THE FALLOW CONSERVES MOISTURE.

THE loss in evaporation on a neglected surface is 50 per cent. greater than on a surface which has been disturbed 1 inch. At Longerenong College (Victoria), experiments showed that the difference in moisture was equal to 492 tons of moisture per acre in a worked area in the first 18 inches of soil, and to 281 tons of moisture per acre on a fully neglected surface. It takes 1 inch of rain to grow 3¼ bushels of wheat; so you will see the need for conserving all the moisture.—R. B. BLACK, at Grenfell Bureau Conference.

Poultry Notes.

MAY.

JAMES HADLINGTON, Poultry Expert.

Marketing Poultry Products.*

THE growth of the poultry industry in recent years has been such as to bring us up against necessities which call for more care and greater exactitude in the marketing and distribution of our products. In the marketing of eggs, for instance, which comprises, roughly, 80 per cent. of the total value of the poultry-farmer's output, there is need not only for improvement, but for a revolution in our methods, while our system (or want of it) in marketing table poultry is deplorable.

In order to cover briefly the factors which are vital to the industry, I shall proceed to deal with them under three headings—(*a*) the marketing of eggs for local consumption; (*b*) the marketing of eggs for export; and (*c*) the marketing and distribution of table poultry. In order to emphasise the importance of the subject—not only from the poultry-farmer's viewpoint, but also from the national one—I may say that the annual value of poultry produce in this State is, on the most conservative figures, £3,200,000.

We will consider, first, the marketing of eggs. Our sources of supply can be dealt with under three headings—(1) eggs from specialised poultry-farming; (2) those from side-line sources, such as orchardists and dairy-farmers, and (3) those from the back-yarders who keep poultry as a hobby or to supply domestic requirements. It is to the sources (1) and (2) that the question of marketing is of vital importance.

With this question is bound up the other questions of quality, size, and grading. The quality of an egg is influenced by several factors—the hen that lays it, the class of food fed to the hen, and the freshness or staleness of the article when marketed. Practically, the farmer has control of all these factors up to the time the product leaves his hands. It might be asked, how is the farmer to control the hen factor.

This is largely dependent upon whether (*a*) the hens are young or old; (*b*) the physique of the hens is good or the reverse; (*c*) the breeding and rearing are satisfactory; (*d*) the chickens are hatched at the right season of the year and sufficient young stock are raised yearly to replace the whole of the farmer's flock every two years. It is only by complying with the last of these requirements that the poultry-farmer can ensure young laying hens, and young hens—other things being equal—lay the best quality eggs.

Quality in an egg is also known by the colour of the yolk, density of the albumen, and the colour and texture of the shell. Feeding has an influence on each and all of these items, but so also has the age and condition of the

* Notes of a lecture delivered at the Royal Agricultural Society's Show, April, 1927.

birds. The eggs from an aged hen, for instance, may be poor in quality in one or all of these respects, due solely to her age, but even a younger hen, as a result of exhaustion due to abnormal laying or an anæmic condition of health, may also lay eggs similarly poor in quality. Inadequate or wrong feeding can also be responsible for these troubles.

The Influence of Feeding.

With regard to feeding, it is a well attested fact that, in order to produce good eggs in large numbers, the hens must be fed a suitably-balanced ration. That is to say, they must be fed a proper ratio of flesh-forming to heat-producing elements, plus mineral matter in the form of shell grit. The laying ration for poultry is expressed in terms of protein, carbohydrates, and fat. Usually the latter two are expressed in one item, but it is now known that, although for the purposes of classification, heat-producing and flesh-forming elements are still expressed in their original terms, fat is an essential part of diet in conjunction with carbohydrates. However, a suitably-balanced ration (the whole food for a day) should consist of 1 part protein to 4½ parts of carbohydrates and fat. The usual expression of this is 1 to 4·5. A lower protein content would constitute too wide a ration, while a higher one would be too narrow. This is how nutrition is adversely affected, and proper nutrition is necessary to sustain the laying of good eggs. It is not sufficient to feed a chemically-balanced ration; it must be composed of suitable material. It is well known that the feeding of maize has an appreciable effect on the colour and quality of the yolk, one of the points already mentioned. Then again, the quality of the albumen depends largely on the health of the hen, in conjunction with proper feeding, while the quality of the shell depends on suitable shell grit, plus good health.

So much, then, for the factors governing the quality of eggs when laid.

Handling Eggs on the Farm.

No matter how good eggs are in quality when laid, they can be spoiled by staleness or by subjection to heat. Obviously, the handling of eggs on the farm has a considerable bearing upon the condition of the eggs when they reach the consumer. If, for instance, male birds are run with flocks of hens, the eggs of which are intended for market, much greater care is necessary to see that they are not subjected to heat than where only infertile eggs are being produced. But the fact of eggs being fertile is not the only reason why they should be kept cool. There are others—the liquefying of the albumen content of the egg, and the shrinkage of the contents, resulting in enlargement of the air cell, which is the main tell-tale in the determination of staleness.

There are other causes of premature shrinkage, such as thin shells and exposure to draughts. The best way to keep eggs in hot weather is to pack them in the cool of the morning into the cases which are to convey them to market, and to stow them away in as cool a place as is available on the

farm until marketing day. If there are a number of cases, the closer they are packed together and covered up the cooler they will keep. Thinness of shell, as already intimated, depends upon an adequate supply of shell grit plus the health of the hens.

Market Twice per Week.

The next feature is time of marketing. To ensure the eggs reaching the market in a reasonably fresh condition they should be despatched twice per week. A rule to this effect was adopted by the Producers' Distributing Society some few years ago, but unfortunately it is apparently more honoured in the breach than in the observance in many cases. In winter time no great damage may result if the eggs are handled otherwise than suggested, but during the summer months deterioration results to a portion of the eggs from marketing only once per week. This is one direction in which it is absolutely necessary that the poultry-farmer should mend his ways, because if the Government carries into effect the resolution emanating from the Bathurst Conference on the size of air cells as the determining factor in the freshness of eggs, the farmer who markets only once per week will find many of his eggs classed into second grade quality. The resolution in question read as follows:—

"In order to protect consumers, we recommend the Government to take action to prohibit the sale of any eggs as fresh eggs, the air cells of which are of greater depth than one-eighth of an inch."

In explanation of this decision of the Poultry and Egg Committee, it might be explained with an air cell one-eighth inch deep in an egg corresponds approximately to the diameter of a sixpence. If eggs are to reach the consumer in a fresh condition, it is necessary that the air cell be not larger than a threepenny piece when the egg leaves the farm; hence the advice to market twice per week.

It is, of course, equally imperative that eggs be not kept by agents until they go stale. Quick distribution is a most essential factor in dealing with eggs to ensure freshness and thereby command the confidence of the consuming public. How necessary such confidence is to the poultry industry is shown by the fact that we exported from this State last year approximately 70,000 cases, or 2,100,000 dozens of eggs, the greater portion of which, it is calculated, could have been consumed locally were our own people consuming eggs on a reasonable estimate of potential consumption. These eggs, it should be remembered, were the cream of our production during the months covering the export period. Everyone concerned is, I think, fully seized of the fact that our own market is the best market; therefore to increase local consumption should be our first aim. This can only be done by the elimination of faulty eggs (especially in respect of the factor of staleness) and in order to accomplish that, methods of marketing and distribution must be mended.

Export and Cold Storage.

This discussion on eggs would be incomplete without a reference to export and cold storage as a means of disposing of our surplus.

A good deal of discussion has of late ranged around these methods of marketing. As matters now stand, unless we can largely increase home consumption, we have no alternative but to export our surplus eggs, even though this may involve considerable loss. In no other way is it possible to keep eggs at a price that will cover cost of production. The consuming public, not knowing the facts, might reasonably ask why, if loss has to be faced on eggs exported, they cannot benefit instead of people overseas. This question might be raised with practically every article exported, but with this difference, that the exporting season for eggs covers only about ten weeks in the period of flush production. If the poultry-farmer had to accept a lower price for his eggs during this period in order to conform to anticipated export parity, it would so affect the average price for the whole year as to make poultry-farming an unprofitable occupation. The result would be restricted production and higher prices in succeeding years.

Packing and Grading.

Having dealt with quality and volume of production, and their influences in connection with both marketing and consumption, we can now turn our attention to other features of marketing, such as packing and grading, both on the farm and for export. Time was when very little attention was paid to grading, and packing was much more haphazard than at present. In recent years a good deal of educational work has been done in these connections, and grades have been established both for home consumption and for export, with the result that quotations for different grades are now a regular feature of market reports.

As far as size are concerned, there are three grades:

First, eggs ranging from $1\frac{3}{4}$ oz. upwards, but averaging not less than 2 oz

Second, eggs below $1\frac{3}{4}$ oz. and down to $1\frac{1}{2}$ oz. (classed as medium).

Third, eggs below $1\frac{1}{2}$ oz. (known as pullet eggs).

For export practically only first grade is accepted, although about 300 cases of medium size eggs were exported last season—partly with a view to testing the market for smaller eggs, and partly to get rid of a surplus of the medium size. At this time last year considerable propaganda was carried on for the establishment of a first grade with a minimum weight of 2 oz. This, however, was not acceptable to the P.F.A. Conference sitting at the time, and it was declared against as not being in the best interests of the producer. Notwithstanding that verdict, however, 4,000 cases of eggs were packed for export at a minimum of $1\frac{7}{8}$ oz., but the rejections proved so heavy that it is questionable whether this grade will again be attempted, unless indeed the regulations on grading for export about to be issued by the Commonwealth insist on that minimum weight, which is now considered unlikely owing to the opposition being shown to it from all quarters.

The main point in this connection is that it is estimated that at least 20 per cent. of eggs coming between the weight of $1\frac{3}{4}$ and $1\frac{7}{8}$ oz., which means that one-fifth, or 420,000 out of the 2,100,000 dozens, would have been

rejected—a rather serious item when it is considered that the 420,000 dozens would have had to be sold locally at a reduced price of about 3d. per dozen, representing a loss to poultry-farmers during the ten weeks of the export season of £5,250. This loss would have been doubled, too, had certain people had their way in bringing about a grade with a minimum of 2 oz.

All this would be understandable if such a grade was the recognised standard in Great Britain or America, but such is not the case.

The grading of eggs was fully dealt with in these Notes in June of last year.

"The Common Colics of the Horse."

Mr. H. Caulton Reeks' work, well known under the above title, has become a classic. In the covers of the Fourth Edition just published is to be found one of the most profound and comprehensive studies of this difficult subject in English literature. If one impression more than another is left on the reader, it is the evidence of the deep physiological and pathological knowledge required by one who would undertake to diagnose and treat colic in the horse rationally and successfully. His condemnation of opiates is well known and generally accepted as correct, although his apparently drastic treatments do not meet with universal approval, and in the hands of the unskilled would invite disaster. It is a book which every practising veterinarian should possess.

The Rural Migration Problem.

Rural migration is one of the oldest of all social phenomena, yet in the last few decades it seems to be accelerated by some special factors. The purely economic factors in this migration are so well known as to have become commonplace. They may be summarised under two main propositions. First, the demand for the great staple products of agriculture seems to have about reached the limit of expansion except as population increases. Second, the product per worker in agriculture has enormously increased and seems likely to increase still further.—T. N. Carver, in the *Journal of Farm Economics*.

A Useful Lick for Sheep.

A large number of owners provide salt as a lick for their sheep, experience having taught them that their stock then "do" better. What actually happens is that the vitality is increased, the functions of the body are carried out more faithfully, digestion is stronger, and the animals are able to obtain more nourishment from their food, and so are less subject to disease than those not supplied with salt.

While salt has shown itself to be beneficial, it will be found more advantageous to supply a compound lick such as Liverpool salt, 30 parts; sterilised bonemeal, 5 parts; sulphate of iron, 1 part. This should be available for the sheep at all times in covered troughs.—H. G. Belschner, District Veterinary Officer, Orange.

Orchard Notes.

May.

W. J. ALLEN and W. LE GAY BRERETON.

Preparations for Planting Deciduous Trees.

WHERE the land has been ploughed and subsoiled some time previously, it will probably now only need working up with harrows and cultivators, though in some cases a cross-ploughing may be first advisable. In all cases endeavour to finish with a deep-stirring implement that will bring the clods to the top and allow the fine soil to remain underneath.

A fine surface has its advantages in laying out, and for this reason the land may be rolled just prior to the operation, but it should be remembered that though the roots should come in contact with fine soil, a surface of small clods is a more lasting mulch than one of very fine soil. A cloddy surface also allows the rain to enter the soil more freely than a fine one.

The advantage of ploughing and of subsoiling where necessary, some months prior to planting, is that the soil has a chance of absorbing and retaining any rain that falls, and generally it will be in moist enough condition for the trees to be planted in the early part of the winter.

Points for Planting Out.

Early planting of deciduous trees—say, June and early July—is advocated, because the roots of deciduous trees commence growing in the spring long before there is any move in the tops, and it is an advantage for the trees to be in their permanent positions when that first root action takes place. Of course, the soil must not be too wet or it may become puddled.

Well-grown trees, one year from bud or graft, with well-developed roots are preferable. Long roots are very troublesome to settle satisfactorily when planting, and it is better to cut them back to about 8 inches. The bottom of the hole should have a crown in the centre so that the roots can be spread out with a downward tendency.

It is most important that the fine soil be rammed well in with the heel to bring it in close contact with the roots as the hole is filled in. The top of the hole should be left loose to act as a mulch. If planting when the soil is dry cannot be avoided, the holes should not be completely filled, and each tree should receive eight or nine gallons of water; when that has completely soaked away the hole should be filled up with dry, loose soil. A watering in this way is very useful in settling the soil around the roots, but care should be taken to avoid tramping close around the tree while the soil is soaked. The tree should be cut back to the desired height after planting.

The Square or the Hexagonal System.

There is sometimes contention whether the square or hexagonal system of planting should be followed, and it is doubtful whether the point will ever be decided. The hexagonal system certainly does offer three main ways of

working, against only two ways in the square system, and sometimes this has a distinct advantage on steep hillsides. However, it is unwise to rely solely upon this, and on such hillsides it is far wiser to lay out in blocks, altering the direction of the rows according to the contour in each block. Given the same distance between trees, more trees are accommodated in a given area by the hexagonal method than by the square method, but it is wiser to base the number of trees per acre on the carrying capacity of the land and other conditions, and to adhere to that number whatever system of lay-out is adopted. For instance, if it has been found under certain conditions that certain trees are satisfactory when planted 24 feet apart on the square system (which, discarding fractions, gives seventy-five trees per acre), and it is intended to plant more of such trees under similar conditions but on the hexagonal system, then it is better to space them at a distance that will give aproximately the same number per acre, which means that they will be 25 feet 9 inches apart.

As already mentioned, when laying out an orchard on a slope liable to wash during heavy rains, the area should be divided into blocks according to the contour of the land and the direction of the rows fixed accordingly, so that the furrows left in ploughing or cultivating, when carried out in one direction, will carry the water they collect at an easy grade. Sufficient surface retaining drains should also be provided at an easy grade to prevent heavy flows of water over the cultivated ground. These drains should be made before planting, as too often when put off till later serious damage is done before the work is carried out.

A leaflet on laying out and planting is obtainable, post free, from the Under Secretary, Department of Agriculture, Sydney.

Codling Moth.

The apple and pear grower will have completed his packing season, except in some instances where some late-keeping apples have been stored. Before turning to winter work the orchardist should put his packing shed in order. All receptacles such as cases or bags that have held apples or pears during the season should be dipped in boiling water for not less than three minutes. Any packing-shed appliances that cannot be dipped should be thoroughly searched for any codling grubs concealed therein, and if at all possible the shed should be made moth proof.

The bandages should still be kept on the trees, as it is not uncommon to find grubs late in the winter in bandages that have been previously cleaned.

Woolly Aphis.

Where woolly aphis has got ahead during the picking and packing season, the trees should be thoroughly sprayed with tobacco wash or nicotine sulphate. Apple-growers who have not tried or have failed to establish the *Aphelinus mali* parasite should make arrangements for a supply next season.

Leaflets on codling moth, woolly aphis, and tobacco wash are procurable from the Department of Agriculture.

Pruning.

Tests carried out by the Department have failed to indicate definitely whether pruning early inclines a tree to break into growth during a mild spell in early winter, but where large areas have to be handled it is generally more economical to get an early start and so give a longer pruning season. Too many instances occur where the pruning is delayed, with the result that the grower finds his ploughing put off too late, at grave risk of losing moisture just when it is required, and of being crowded on to his spring spraying.

NON-SETTING OF FRUIT LAST SEASON.

NON-SETTING of fruit has troubled orchardists generally during the present season, and departmental explanations of the failure have been given some prominence in the press. A typical instance of poor setting (of apples and pears) was investigated in the latter part of 1926 on behalf of members of the Batlow packing-house and the Batlow branch of the Agricultural Bureau. Thrips seemed to be the main cause of the condition in some fruits, but it was accentuated by: (1) Unfavourable climatic conditions during the blossoming period; (2) weakness of the blossom buds caused by the dry spell last January and February; and (3) carelessness in cultivation.

A very dry spell was experienced last season, and consequently (and especially in cases where a grower had been careless in cultural work) the vitality of trees, especially of those carrying fruit, was adversely affected. Insufficient or neglected cultivation results in greater loss of soil moisture, which lowers the vitality of the tree, a condition that is reflected in weakness of the blossoms. Trees which carried no fruit last year, and as a consequence bore a lessened strain upon their vitality, and also trees whose owners pursued sound cultural methods and thereby conserved sufficient soil moisture, set fair crops. Weak blossom buds take longer to develop than strong buds, and as a consequence the thrip has a longer period during which to carry on its destructive work; a strong blossom bud opens more quickly than a weak one, and fertilisation has more chance of taking place before serious damage is done to the organs of reproduction.

Unfavourable weather conditions often retard the opening of blossoms, and in such cases also the thrip has a longer period during which to carry out its depredations. Frosts injure the essential organs of reproduction and prevent fertilisation, and also destroy young fruit after fertilisation has taken place. Cold winds and excessive rains greatly interfere with the activity of the bees, with consequently poor settings, and weak blossoms often fail to set fruit, no matter how favourable the conditions may be. There certainly was a combination of adverse factors at work at Batlow, but the predominant factor was thrips.

There is no doubt that here, as well as in other districts, insufficient attention has been paid by a number of growers to conservation of soil moisture and the maintenance of soil fertility. Good results can only be obtained by good cultural work, and by improving the physical condition of the soil by ploughing in suitable green crops. Such treatment would, of course, react favourably upon the trees and upon their crops.—H. BROADFOOT, Senior Fruit Instructor.

Agricultural Gazette of New South Wales.

Fodder Conservation Competitions.

SOME JUDGES' REPORTS.

THE R.A.S. MIDDLE WEST CHAMPIONSHIP.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

As the method of fallowing has gradually come to be regarded as an essential to successful wheatgrowing, so too will fodder conservation assuredly become recognised as the stockowners' sheet-anchor. In fact, the adoption of fallowing methods by the wheat-grower is analogous in many respects to the conservation of fodder by the stockowner; both render possible the securing of payable returns in spite of dry periods, and both assist in the production of maximum results under average conditions.

Ample stocks of conserved fodder not only represent an insurance against drought by enabling the stockowner to keep his stock alive during the inevitable lean periods, but permit of the stocking of a property to its full capacity year in and year out with safety, and, moreover, with greater profit, for rarely is a year experienced without a period of scarcity. However short their duration, the availability of conserved fodders to maintain the condition of stock over such periods will make a surprising difference in the ultimate returns—at times sufficient to spell the difference between success and failure. This is especially the case where the objective is the production of fat lambs.

In last year's prolific season comparatively few landholders took advantage of the luxuriant growth of self-sown wheat, wild oats, and herbage which was available for conversion into silage merely for the cost of harvesting and pitting. It is to be deplored that thousands of tons of this valuable fodder which could have been conserved at very small outlay were allowed to waste, and, moreover, in some cases to become a positive detriment by fouling cultivation land with wild oats and other weed seeds, and even by providing fuel for bush fires.

Local competitions were conducted by three agricultural societies, viz:—Dubbo, Narromine, and Parkes.

From the experience of the previous year's judging it was found necessary to revise the scale of points so that it would provide a more equitable basis for competition by both small and large property owners. While the scale adopted was an improvement on that used for the previous year's competition, the necessity is apparent for a further revision in order that the basis for the awarding of points may be standardised

The conditions and scale of points adopted for areas other than coastal was as follows :—

Fodders eligible for conservation to be :—

Concentrates (including all grains) ; roughage (as hay, *e.g.*, lucerne, oaten, wheaten, barley, or grass, or silage); and any other fodder suitable for conservation.

SCALE OF POINTS.

		Points.
1. Suitability and Quality of Fodder		**55**
(*a*) Judged according to the suitability of fodder or combination of fodders for the purpose for which they are required	25	
(*b*) Judged as to appearance, apparent palatability, and nutritive and feeding values	30	
2. Location and Protection		**50**
(*a*) Locality.—Location of the site having regard to fire, flood, economy in feeding, and general access	10	
(*b*) Protection.—Protection from weather, pests, and general deterioration	40	
3. Cost of Production and Originality of Method of Conservation To be based on relative cost of production and value for the district		**15**
4. Carrying Capacity Quantity for the requirements of competitor's holding to be based on the sheep carrying capacity of the holding, cattle and horses counting one to six sheep. The maximum amount to be considered competitor's requirements per sheep to be 5 cwt. of lucerne hay or its equivalent in feeding value. (1 cwt. lucerne hay = 1½ cwt. cereal hay = 3 cwt. silage = ¾ cwt. grain.)		**60**
5. Quantity of Fodder Available for Marketing		**20**
Total		**200**

Judging was commenced at Parkes on 28th March and completed at Dubbo on the following day. The awards were as follows :—

CHAMPIONSHIP Fodder Conservation Competition Awards.

Society.	Name and address.	Suitability and quality of fodder. (a)	(b)	Location and protection. (a)	(b)	Cost of production and originality of method.	Carrying capacity	Quantity available for marketing.	Total.
1. Parkes ...	E. J. Johnson, "Iona," Wongalea.	20	25	9	39	10	60	2	164
2. Narromine	Chas. Cullen, "Nellie Vale" Narromine.	17	23	8	30	12	60	10	160
3. Dubbo ...	Cullen Bros. "Bunglegumbie," Dubbo.	18	21	8	34	8	60	8	157

Mr. E. J. Johnson's fodders which won the championship were produced on a property of 878 acres, of which 400 acres were cropped with cereals last season, 240 acres are now fallowed, 5 acres are under lucerne and the balance of 233 acres is pastures. The stock now carried are 600 sheep, fourteen horses, and two cattle.

The stored fodders were for the most part of very good quality and provided a satisfactory variation of feeds for supplying a balanced ration, and they were effectively protected from the weather and pests. They comprised 172

tons of prime oaten hay (harvested from a crop of Mulga oats) which had been baled and stacked in a large shed which had been rendered mouse-proof by surrounding it with plain galvanised iron placed 1 foot in the ground and 3½ feet above ground, care having been taken to prevent mice from climbing the fence where the sheets of iron were joined; two stacks of wheaten hay, one stacked in 1924 and the other in 1925, totalling 38 tons, had not been protected from mice and the older one had suffered deterioration as the result of their ravages ; 56 tons of wheat and 55 tons of Mulga oats from the previous year's crop, the former stored in a shed and the latter in a galvanised-iron silo constructed of 18-gauge iron on a concrete foundation. In addition there was also conserved one pit of silage containing 73 tons harvested from a crop of Lachlan oats the previous season.

With the exception of the 38 tons of wheaten hay the whole of the fodders had been harvested from the crops grown in 1926, and the stocks of fodder sufficed to support the whole of the stock that the property was normally capable of carrying over the period allowed for in the scale of points, and still to have a surplus available for marketing which would feed nearly half as many again.

Mr. C. Cullen, the second prize winner, has a small property of 315 acres, which is used chiefly for dairying and cereal growing, and on which he runs twenty-four cattle and twenty-four horses. Only 35 acres was in pasture and the rest of the property had grown cereal crops during the previous year. He has wisely conserved a large quantity of fodder in comparison to the size of his holding, mainly for the purpose of maintaining the milk supply over periods of scarcity; he learnt the value of fodder conservation in the 1919 drought when he was obliged to purchase fodder at very high prices. Included in his stock of fodder are two pits of silage totalling 322 tons, one of which was wheat harvested in 1925, and the other was conserved in 1926 from a crop of Mulga oats. There are three stacks of wheaten hay, two of which were produced in 1925 and one in 1926, and one stack of oaten hay which had been stacked in 1920, making a total of 76 tons of cereal hay. The only grain reserve was 8 tons of wheat.

The total reserve of fodders is sufficient to support more than three times the normal carrying capacity of the property, but provision had not been made for adequate protection of the cereal hay. The stacks had been built on the ground without any dunnage, the result of which usually is that moisture rising from the ground damages the hay in the bottom portion of the stack. The stacks had not been thatched to prevent deterioation by rain, and no attempt had been made to keep mice out of the stacks.

"Bunglegumbie," the property of Cullen Bros. at Dubbo, is 1,070 acres n area; 475 acres were cropped with cereals last season, 100 acres are fallow, 70 acres are under lucerne, and 425 acres in pasture. The stock at present carried are 950 sheep, including lambs, thirty-one horses, and eleven cattle.

The carrying capacity is reckoned at a sheep to the acre. Cereal hay is conserved in seventeen stacks and two sheds, totalling 640 tons, of which 250 tons were harvested in 1920, 220 tons in 1923, 60 tons in 1924, 60 tons in 1925, and 50 tons in 1926; in addition to this there are 5 tons oaten chaff in bags, 182 tons of lucerne hay in six stacks, and one shed harvested in 1924 and 1925, 45 tons grass hay (mixed with lucerne), 35 tons straw, and 8 tons wheat grain, making a grand total of 915 tons of fodder. According to the equivalents and period arranged for in the scale of points, the stocks of fodder should be ample for two and a half times the number of sheep the holding could normally carry, pre-supposing that the whole area was in natural pasture.

A notable feature of Messrs. Cullen Bros.' conserved fodder is the excellence of the protection provided against weather damage, all the stacks being very well built on dunnage of timber and a splendid job made of the thatching of the stacks. There was, however, practically no protection against mice, although so far very little damage has been caused by them, due, no doubt, in no small measure to the good stack building.

Speaking generally, there is room for improvement as regards the protection of conserved fodder, and these competitions are serving a very useful purpose even if they do no more than indicate the necessity for the more adequate protection of this most valuable asset from deterioration by weather and pests. It is noteworthy that each competitor had made provision for sufficient fodder for a full ration for a period of nine months for the total number of stock that his property was capable of carrying, and, in addition, has a surplus of fodder which would be available for marketing. The provision in the scale of points to allow credit for this marketable surplus is wise as it encourages the conservation of fodder, not only for the needs of the holding upon which it is produced, but also for a supply to be available during drought periods at prices that are not prohibitive to stockowners in the far western parts of the State where the production of fodder is not economically possible.

THE PARKES COMPETITION.

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

For the past two years the Royal Agricultural Society has made efforts to interest country P.A. and H. Associations in fodder conservation competitions. Perhaps owing to such competitions being new and to a doubt as to the system of judging being equitable to all interests, the response has hardly been up to expectations, but it is felt that when the competitions are better understood, the beneficial results accruing from them may approach those of the crop competitions. The judging in fodder competitions is rather more complicated

than in the case of crop and fallow competitions, and there are many problematical factors to be considered. The scale of points* has been designed to suit all farmers in similar districts, whether on large or small areas, or whether devoted to mixed farming or to grazing.

An Analysis of the Scale of Points.

(1) *Suitability and quality of fodder.*—When considering section (*a*) the points allotted are based upon a suitable, well-balanced ration required by one sheep per day. The consensus of opinion among the competitors is that a suitable ration would be 1 lb. cereal hay, 2 lb. silage, and 3 oz. grain. The points allotted in the competition have been governed by the relative amounts of such fodders, sufficient for all stock carried, stored by the competitor. For instance, if sufficient hay has been stored but not sufficient silage, the fodder would not be well balanced, and loss of points would result.

For section (*b*) the quality of each stack of hay, pit of silage, and quantity of grain is allotted points. The points for quality are then averaged, in the proportion which each stack, pit, &c., is to the quantity of the fodder stored.

(2) *Location and protection.*—The same method has been followed when allotting the final points for location and protection.

(3) *Cost of production and originality of method of conservation.*—In considering this section methods that entail an excessive cost of production (such as concrete pits, or too elaborate means of conservation) would cause a loss of points. When considering the originality of method such factors as bin storage of oats, or baling of hay, would increase the points scored.

(4) *Carrying capacity.*—In this case the stock-carrying capacity of holdings in conjunction with the system of farming followed needs to be determined, and in the case of a man understocked the amount of fodder which he should have is based on such a number, but a farmer carrying a greater number of stock than the normal carrying capacity should conserve fodder for the number carried. In determining the amount of fodder required the scale states that cattle and horses count as one to six sheep (one being equal to six sheep) and that 5 cwt. of lucerne hay or its equivalent in fodder value should be provided for each sheep. Such a quantity would make provision for nine months with a full feed ration, or three months partial feed at the commencement of a drought, six months full feeding during the drought and three months partial feeding after the breaking of the drought.

To determine the points here the total fodder conserved has been expressed as tons of lucerne hay, each ton making provision for four sheep and so the number of sheep each farmer has provided for has been determined. If the number carried is greater than provided then points have been dropped in proportion to the difference.

* See Scale of Points in the report of the Championship Competition on page 430.

(5) *Marketable surplus.*—The points for the marketable surplus have been determined from the quantity available for marketing, and these points have been in proportion to the amount of fodder conserved above the actual quantity required.

The awards were as follows :—

Position.	Competitor.	Suitability and Quality.		Location and Protection.		Cost of Production.	Carrying Capacity.	Marketable Surplus.	Total.
		(a)	(b)	(a)	(b)				
1.	E. J. Johnson, "Iona," Wongalea.	20	25	10	38·7	13	60	5	171·5
2.	A. P. Unger, Stony Hill, Alectown.	20	26·4	9·3	31·5	8	45·2	...	140·4
3.	W. W. Watson, "Woodbine"	20	26·8	10	32·3	12	38·4	...	139·5
4.	J. Freebairn, "Adavale"	20	22·9	7·4	27·6	10	39·7	...	127·6
5.	J. Clatworthy, "Beechmore."	15	25	9·3	32·2	13	23·5	...	118·0
6.	J. R. Postlethwaite, "Keilor."	16	22·9	7·4	26·0	10	28·7	...	111

The Fodders Conserved.

The competition was won by Mr. E. J. Johnson, "Iona," Wongalea, and he thus became eligible for the championship. Details of the fodder stored are recorded in the report of the championship on page 430.

Mr. A. P. Unger, "Stony Hill," Alectown, was placed second. His property of 1,050 acres is comprised of chocolate to red loam to clayey loam soils, of which 300 acres will be cropped to wheat, 80 acres to oats, 250 acres are to be fallowed. Mr. Unger is carrying 1,150 sheep, twenty horses and five cattle, which is equivalent to 1,300 sheep. The amount of fodder conserved, expressed as lucerne hay, is 245 tons, sufficient to provide for 980 sheep. The actual requirements would be 162 tons of hay, 324 tons of silage, and 32 tons of grain. In this case sufficient fodder has not been conserved for the stock carried, thereby occasioning loss of points in the carrying capacity. The fodder conserved was 400 tons of silage, 140 tons of cereal hay, and 14 tons of grain, which shows a slight shortage in hay, an excess in silage, and a shortage in grain. The silage and one shed of hay were well located, and the silage was well protected, and of good quality. One hay stack was protected, and was of medium quality. Some other stacks of hay were not well located; the protection was poor, and the quality medium to poor; 120 bushels of oats and 450 bushels of wheat were of good quality, fairly well located, but lacking protection from mice, being merely stacked in a shed.

Mr. W. W. Watson's property, "Woodbine," Tichbourne, is of 2,200 acres, and comprises greyish to red light loam country, of which 750 acres will be cropped with wheat, 100 acres with oats, and 10 acres with lucerne, while 600 acres are to be fallowed. The number of stock carried is 1,500 sheep, thirteen horses, and twelve cattle, equivalent to 1,650 sheep. The amount

of fodder conserved is equal to 264 tons of lucerne hay, made up of 175 tons of silage, 226 tons of cereal hay, 12 tons of lucerne hay, and 32 tons of grain (oats), or sufficient fodder for 1,056 sheep. The fodder conserved shows an excess of hay, a slight shortage of grain, and a rather big shortage of silage. The actual requirements, based on the scale, would be 206 tons of hay, 412 tons of silage, and 41 tons of grain.

The silage was well located, well protected, and of excellent quality. The cereal hay was generally well located; the protection was medium to good, and the quality good. Some of the oaten and all the lucerne hay was baled. The 1,800 bushels of oats was conserved in an iron tank and a square iron silo.

The property of J. Freebairn, " Adavale," Goonumbla, consists of 2,560 acres, of red loam to clayey loam country. An area of 580 acres will be cropped with wheat, 70 acres with oats, 10 acres with lucerne, and 400 acres are to be fallowed. On the property 1,550 sheep are carried, with twenty horses and twelve cattle, or the equivalent of 1,742 sheep. The amount of fodder conserved was 310 tons of silage, 277 tons of cereal hay, but no grain, being equivalent to 288 tons of lucerne hay, which would provide for the feeding of 1,152 sheep. The amount of suitable fodder to meet requirements would be 217 tons of hay, 434 tons of silage, and 43 tons of grain. The amount conserved shows an excess of hay, a slight shortage of silage, and a complete shortage of grain.

The silage was contained in three pits, two of which, however, were not well protected, having sunk to and below the ground level. The quality was medium, being rather of a sour nature, although such silage is quite suitable for feeding. Most of the hay was cut from the 1926 crop. With the exception of 68 tons of wheaten hay, which had been baled and stacked and protected with an iron roof, the hay was located on the headlands of a cultivation paddock, which can hardly be recommended. The stacks had well timbered bottoms, were well built, and are to be thatched and fenced against mice invasion. The quality was prime. Although no grain had been provided this deficiency was largely made up by the large quantity of prime oaten hay.

Mr. J. Clatworthy's holding, "Beechmore," Goonumbla, contains 2,560 acres, and the soil is red to chocolate loam to clayey loam. Of the total acreage 700 acres are to be cropped to wheat, 80 acres to oats, and 200 acres are to be fallowed. The number of stock carried is 2,000 sheep, ten horses, and eight cattle, or equivalent to 2,100 sheep. The amount of fodder conserved was 80 tons of silage, 237 tons of cereal hay, and 16 tons of grain, or equivalent to 206 tons of lucerne hay. Such an amount of fodder is sufficient for 824 sheep. The amount of fodder to meet requirements would be 262 tons of hay, 524 tons of silage, and 52 tons of grain. The amount conserved shows a slight shortage in hay, a big shortage in silage, and a fairly large shortage in grain. The location of the silage was good, but protection was lacking;

the pit had not been well covered or drained. The quality was good, though showing a little excess waste on the top. The greater part of the hay had been pressed well and safely stored in sheds, while the quality was good to prime. Of the grain, 700 bushels of oats were stored in a galvanised iron tank and 150 bushels of wheat were stacked in bags in the shed.

On Mr. J. R. Postlethwaite's property, "Keilor," Nelungaloo, the soil is chocolate to black clayey loam. The area is 2,300 acres, of which 700 acres will be cropped to wheat and 500 acres are to be fallowed. The number of stock carried is 1,400 sheep, six horses, and fourteen cattle, equal to 1,520 sheep. The amount of fodder conserved was 110 tons of silage, 165 tons of cereal hay, and 97 tons of grain (oats), which is equivalent in feed value to 182 tons of lucerne hay. This amount of fodder is sufficient for 728 sheep. The amount of fodder required to meet stock requirements is 190 tons of hay, 380 tons silage, and 38 tons grain. The amount conserved therefore shows a little shortage in hay, a big deficiency in silage, and a medium shortage in grain. The silage was fairly well placed, but the pit was not well drained, and the quality was medium to good. The hay was scattered about the property (the value of the location varied) and the protection was poor to medium, while the quality was poor to good; 1,500 bushels of oats were well and safely put by in a galvanised-iron tank.

General Comments.

As this is the first occasion that a competition of this kind has been held in the Parkes district and attention has not previously been focussed upon the apparently large amount of fodder needed to make provision for drought periods it may seem that the table provides for an excessive amount of fodder conservation. Capitalising the value of the fodder at drought time prices, it would seem that the cost of fodder would be about £1 per sheep, and the question arises whether the business is economically sound. But such fodder is conserved in flush seasons, when prices are low, so really the capital value of the fodder is considerably less. Again, it may seem that the quantity—equivalent to 5 cwt. of lucerne hay per sheep—is too great, but after all, this amount is only equal to 2 lb. of lucerne hay per sheep per day for nine months, and experience has taught that we are likely to get dry periods when feeding will be necessary for twelve months—perhaps not twelve consecutive months, but months placed in between sparse grazing periods when the conservation of fodder is not possible. Such matters need the consideration of the farmers and their experience may be able to suggest amendments which would improve the practical aspects of the competitions.

Reviewing the amount of fodder conserved by each competitor it seems that there is room for improvement in providing for a combination of fodders, especially with respect to a greater supply of silage. If oaten hay is conserved there may be a reduction in the amount of oaten grain, but if it is wheaten hay, concentrates in the form of grain need to be provided.

With respect to the location of fodder, the ideal, no doubt, would be to have two (and on large properties perhaps three) fodder reserves, situated away from cultivation paddocks, and well protected from fire and stock. At present the fodder is generally too scattered over the property, and although in such a case fire may only destroy one stack, there is greater work involved in making fire breaks for all stacks.

Protection from mice is a fairly big problem, and there are indications that an iron fence, as now erected, is not mouse-proof. However, such a fence does aid considerably and could be more generally used. It would perhaps pay for stacks that are being kept for some years to be thatched. The pressing of hay has much to commend it, especially in regard to space, economy, feeding facilities and great ease of protection. Grain stored in bins is the ideal method, in fact the only method worth adopting. Most of the competitors follow this practice, and no doubt it will extend as its advantages become more widely known.

THE NARROMINE COMPETITION.

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

The entries though small in number (four) were representative of various classes of holdings from the big sheep grazing property to the small mixed farming and dairying proposition. The main objective of these competitions is not necessarily to find the property which has the greatest amount of fodder stored in relation to its size, but to bring before the notice of those many men on the land who so far have not taken any definite steps in connection with this all important matter of fodder conservation, what is being done by a few in their midst in this direction, and in what manner the fodder is being conserved. By this means emphasis may be given to the necessity for fodder reserves for the dry time which will surely come sooner or later with its usual general mortality amongst stock.

In judging* these competitions the greatest prominence is of course given to quantity of fodder stored and available for use when necessary. But the competitor must also give consideration to the question of suitability of the fodder and also its nutritive or feeding value.

To obtain the best results from hand feeding it is necessary to have a balanced ration of proteins and carbohydrates, and this objective must be studied closely. For instance, it is not advisable for a landowner to conserve too much pit silage without taking steps to have either grain, lucerne hay, or some other form of roughage available to feed with it in proportionate quantities. Also, grain cannot be fed successfully and economically on its own—some form of roughage such as hay, straw or silage, must be available to supply the necessary carbohydrate requirements.

* See Scale of Points on page 430.

Consideration must also be given to the question of location and protection of fodder reserves. Silage in pits presents perhaps the best means of avoiding troubles and losses in this direction: nearly any site is suitable for a pit provided it is not low lying and subject to flooding or swamping, but distance of cartage and accessibility for ultimate feeding purposes must be considered, and this class of fodder is practically immune to loss or damage by fire, pests or deterioration. Grain storage is perhaps the next best method, as it is not a difficult matter to keep out pests and dampness. Grain silos are now being largely adopted.

Hay, either lucerne or cereal, stored in stacks, presents the most difficulties in regard to protection. Thatching will keep out rain to a certain extent, as will also good stack building in the first instance; mice and rats can be kept at bay by galvanised iron barriers, but apparently this is not often done or considered worth while by stock owners in spite of dire experience during previous mouse plagues. Also there is always the danger of fire, and for this reason stacks should not be built too close to each other, and should be protected by fire breaks.

The heading "Cost of production and originality of method of conservation" allows for a comparison between the various methods available, and for the economic value of the method adopted. Notice can also be taken of original methods of fodder reserves, such as edible tree plantations, preservation of good straw crops (perhaps used for covering open stables, &c., until required), and also of original methods of storage of grain in bins, silos, &c.

If the amount of stored fodder exceeds the probable requirements of the competitor as laid down in equivalent feeding values under Section 4 of the scale of points, then the surplus would be available for marketing in times of shortage, and it would not be difficult to find buyers for all classes of fodders, including silage. Consideration is therefore given to this available surplus over and above the competitor's requirements.

The results were as follows:—

Competitor.	Suitability and Quality of Fodder.		Location and Protection.		Cost of Production and originality.	Carrying Capacity.	Quantity of Fodder available for Marketing.	Total.
	(a)	(b)	(a)	(b)				
Charles Cullen	18	25	8	34	8	60	17	170
J. H. Drew	17	20	9	37	10	60	10	163
E. R. Crawford...	22	27	8	35	9	59	...	160
C. L. and C. K. Bragg... ...	20	25	7	32	12	40	...	136

Notes on the Competitors' Fodders.

The winner of the competition, Mr. C. Cullen of "Nellie Vale," occupied third place in last year's contest, and is to be congratulated on his increased storage of fodder. His main objective is dairying and on a 315-acre property, including 200 acres leased. Details of the fodders stored are given in the championship report on page 431.

Mr. J. H. Drew of "Little Farm" won second place. On his farm of 720 acres, the normal carrying capacity is 450 sheep, twenty-three horses, and ten cattle. For these he has stored in four pits put down during 1925 and 1926, 630 tons wheaten silage of high-class quality; he also has 45 tons of mixed wheaten and oaten hay, 30 tons straw and 120 bushels wheat. This fodder is estimated to feed 988 sheep or the equivalent of 340 sheep over normal carrying capacity.

Quality is good, particularly the silage, but there is an unbalanced feeding ratio owing to the large proportion of silage. A feature on this farm is, the storage of about 15 tons of straw as a solid pitch roof over an open stable; it is thus fulfilling two purposes.

Stacks are not protected against weather or fire risk, and they are liable to mice attack. The silage is of course safe from all risks as pits are well mounded and covered, and localities have been well chosen.

Mr. E. R. Crawford, "Edendale," was third with 360 tons silage, 90 tons wheaten hay and 1,500 bushels wheat conserved to feed 800 sheep, twenty horses and two cows on a 1,220-acre property, of which 350 acres are under fallow. His nutritive ratio is considered excellent, as a mixture of grain and silage with hay roughage occasionally would, if necessary, keep all stock in excellent condition. There is sufficient fodder stored on this property to feed all stock held for the necessary period, but no surplus. The feeding equivalent is 933 sheep.

Quality of silage is good, but pits are not mounded up sufficiently, and in two cases covered with too much earth to make up for deficiency of contents. Sites are well chosen but the pits require further attention to fill hollows and cover up cracks. The grain is stored in bags in a mouse-proof shed, and is available for sale at any time when the necessity for holding it as a fodder reserve passes.

Messrs. C. L. and C. K. Bragg of "Mungeribar," work in conjunction a property of 7,753 acres, on which are normally carried 8,000 sheep, forty horses, and forty cattle. An area of 2,800 acres is also cropped annually. The fodder reserves consist of 8,100 bushels wheat, 175 tons wheaten hay and chaff, 100 tons prime straw, and a 10-acre kurrajong plantation. This latter consists of 900 well-grown trees which undoubtedly have a high annual feeding value as all classes of stock do well on them in dry times. The ratio of grain to roughage of hay and straw is good, but under the equivalent values laid down there is only sufficient stored fodder to feed 4,271 sheep, or approximately 50 per cent. of the normal carrying capacity.

A great deal of credit is due to these competitors who have come forward and shown others what is being done in their district in the way of fodder conservation. While some may have better opportunities and facilities than others, it does not matter materially in what form the fodder is conserved as long as there is an honest attempt to provide for the future, and not let "to-morrow take care of itself." The main thing in fodder conservation

is to do it well and to guard against the possibilities of outside influences damaging the work done.. Careful consideration should be given to those factors which make for security, namely, protection from weather, pests deterioration, and fire, and also location.

THE DUBBO COMPETITION.

Mr. B. M. Arthur also judged the Dubbo fodder conservation competition, and the table of points awarded will be of interest. In his report to the Dubbo P. A. & H. Association, Mr. Arthur stated that, while some landholders with river frontages had an undoubted advantage in that lucerne could be produced and stored in large quantities in good seasons, it should be the earnest endeavour of all mixed farmers and graziers to make provision for the future, and thus minimise mortality amongst their stock when the pinch eventually came.

The results were as follows :—

Competitor.	Suitability and Quality of Fodder.		Location and Protection.		Cost of Production and Originality of Method of Conservation.	Carrying Capacity.	Quantity of Fodder available for Marketing.	Total.
	(a)	(b)	(a)	(b)				
Cullen Bros.	18	22	7	34	8	60	18	167
Harold Harvey	20	26	9	36	12	58	...	161
F. W. Brownlow	23	25	6	33	10	60	2	159
J. Cullen	21	23	7	34	9	60	1	155
C. A. Wright	22	25	8	35	11	46	...	147
W. W. Baird	19	25	8	37	11	36	...	136

The winners of the competition, Messrs. Cullen Bros. of "Bunglegumbie," who have a property of 1,070 acres with a frontage to the Macquarie River, became eligible for the championship competition, and a description of the fodders stored will be found in the report of the championship on page 431.

THE MURRUMBIDGEE COMPETITION.

G. C. BARTLETT, H.D.A., Agricultural Instructor.

Only one fodder conservation competition was held in the Riverina district this season, that of the Murrumbidgee P. & A. Association. Eight entries were submitted for judgment, and these were within a 30-miles radius. The winner of this competition was also awarded the Royal Agricultural Society's Championship for the Riverina.

One of the main features of successful livestock farming, as in many other industries, is continuity of production, and the conservation of fodder best enables this to be done. It enables more stock to be carried the whole year

round with a reasonable amount of safety. Cultural methods and pasture improvement, &c., provide the means of increasing the carrying capacity, but the conservation of fodders provides the insurance policy to ensure continuity. Fodder conservation competitions are impressing on farmers and graziers the need for having on hand supplies of fodder for hand feeding in dry times.

The fodders most suitable in this district are oaten and wheaten hay, lucerne hay, silage of either lucerne or cereals, and oats as grain. Sheep (especially lambing ewes) or cattle will not do for any length of time, at this dry time of the year, on silage alone or hay alone; but a combination of hay and silage with a little oats as grain makes a fodder which all stock will do well on. This variety in the conserved fodder is an important point.

Lucerne can be grown very well on many of the flats in the district, and the practice of many of the farmers is to sow lucerne lightly, say about 6 lb. to the acre, and use the paddocks for grazing. The first cut of these paddocks, although containing a fair percentage of grass, makes good quality silage, while the lucerne is thick enough later on to give a fair hay cut as required

A good deal more oats is grown in the district than formerly; probably the need for this crop in rotation with wheat as a means of soil improvement and combating fungous diseases is now more realised. One now sees more oaten stacks, while some farmers have put up small concrete or iron silos to store the grain in. The grain is sometimes at a rather low price, but these silos make storing easy and safe, and it becomes a valuable asset.

The question of location and protection is an important one. It is costly and unsafe to have a number of stacks grouped together in one place: it is costly to cart the material to them and then cart it away again a considerable distance to the stock, and it is unsafe because of the risk of fire. A good thatch as protection from the weather is necessary, and a good strong fence to keep stock out. The latter may be a little costly the first year, but it is permanent.

Silage pits should be fairly long and narrow and not too deep (6 feet is considered a fair depth): if very deep they become rather costly, but up to 6 or 7 feet they can be put down for 1s. per cubic yard. From 1½ to 2 cubic yards of silage are considered to weigh about a ton, and a pit to hold 100 tons would cost about £7 10s. These pits should be as perpendicular as possible on the sides; otherwise it is difficult to get the necessary pressure. They should be sloped sufficiently at the ends to allow a team to pull in and straight out. This facilitates filling and also helps to press the material down. They should be well filled up and above ground and allowed to settle a little before completing the covering. If they settle below ground level or with a hollow in the middle there is a risk of water gaining entrance to the silage. They should be well covered with about 18 inches of soil all over, and two good drains made, one down the full length of each side. A little attention may be necessary now and again to fill in any cracks that may form.

A crop that makes excellent silage and one that can be recommended for the district for this purpose is Skinless barley. Nearly all the silage seen in the competition was lucerne mixed with grass.

Mr. A. Brunskill, the winner of the competition, is a pastmaster in the art of silage-making and conserving fodder, and practically all the various points mentioned above were most efficiently carried out. The area of his holding is 6,126 acres, of which 1,280 acres are under lucerne, 500 acres under wheat and oats, and 300 acres are fallow. There are now 6,000 sheep on the holding as well and sixty cattle and fifty horses. This is only possible because the following fodders are conserved on the farm :—

	Tons.
Lucerne silage, 13 pits	3,080
Lucerne hay, 11 stacks	390
Wheaten hay, green, 13 stacks	800
Wheaten hay, ripe, 2 stacks	15
Oaten hay, 14 stacks	940
Chaff	53
Oats (grain)	13½

The following awards were made :—

RESULTS of Riverina Fodder Conservation Competition.*

Competitor.	Suitability and Quality of Fodder.		Location and Protection.		Cost of Production and Originality of Method.	Carrying Capacity.	Surplus available for Marketing.	Total.
	a	b	a	b				
1. A. Brunskill ...	24	29	9	38	12	60	16	188
2. A. Lewington ...	20	25	7	30	14	60	15	171
3. Mrs. A. Lewington ...	16	27	7	30	12	60	10	162
4. Geralgambeth, Ltd.	22	24	8	32	13	50	...	149
5. G. H. Lyons... ...	20	22	7	27	12	55	...	143
6. A. Joss	18	21	7	24	13	55	...	138
7. A. Brunskill (Old Borambola).	22	22	8	28	13	20	...	113
8. J. H. Kendall ...	20	20	6	25	13	12	...	96

* For Scale of Points see page 430.

THE RETURN ON FARM INVESTMENTS.

THROUGHOUT our wheat districts there are unmistakable evidences that farmers are beginning to realise the productive capacity of their soils, but by a methodical system of education showing what other men and districts are accomplishing, much can be done yet to increase the average acre yield. The other end of the industry is not quite so encouraging, as with the falling prices of wheat some scheme must be formulated by which the primary producer will receive an adequate return for his labour and investment, as surely as the manufacturer now obtains his through the customs duties.— W. W. WATSON, President of Western District of the Agricultural Bureau at Dubbo Conference.

Farmers' Experiment Plots.

WHEAT AND OAT TRIALS, 1926.

Northern District.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

THE following farmers co-operated with the Department in conducting cereal experiments in this district during 1926:—

J. G. Perry, Quirindi.
Jack Lye, Loomberah.
G. Dobson, Winton Road, Tamworth.
W. Smith, Warrah, via Willow Tree.
G. Roworth, Warrah, via Willow Tree.
Thrift Bros., Parkville.
R. Darling, Duri.
Scott Bros., "Abergeldie," Currabubula.
W. Bignall, Manilla.
Chaffey Bros., Tintinhull.
A. H. Capel, Barraba.
W. H. Lye, Loomberah,
F. Wild, Dangarsleigh, via Armidale.
A. D. Murchie, Walcha.

Owing to the very poor showing and early heading of the oat trial at Mr. Wild's farm, due to the dry spring conditions, the plots were fed off. Mr. Murchie's results were not available (late district) when this report was prepared.

Notable features of the trial were the efficacy of the dry copper carbonate dusting of oats and wheat seed as a preventive of bunt and the benefit from consolidating and fining the soil about the seed when sown, by harrowing at the time of sowing or shortly after, or by driving a mob of sheep over the field shortly after sowing. The poor stand (lack of density) in crops competing in the field wheat contest at Tamworth was largely due to the seed being in a too open soil.

Superphosphate, or superphosphate 4 parts and sulphate of potash 1 part, applied at 80 lb. and 105 lb. per acre respectively, produced little response on the plots where the soil is typical of the district. A benefit in previous seasons has been reported elsewhere and observation will be made next season.

Feeding off was rarely done throughout the district on plots and tall crops were common. There was little lodging due to the dry spring and tough straw; normal spring weather would have probably caused considerable lodging. A striking instance of feeding off occurred at Mr. W. Smith's, Warrah. The plots were fed off close in July and subsequently grew to 5 feet high.

"Shatter" (grain falling out of the ear before harvest) was fairly prevalent in a number of varieties, notably Florence, Clarendon, and Waratah. The glumes appeared to hold the grain more loosely and were more open than usual. One of the effects of this was the prevalence of sun bleach.

Take-all and foot-rot diseases were very widespread, and although in many instances the effect on the yield was only slight, greater efforts are urged to exterminate the causal fungi, which can be done by long fallow or rotating the wheat crop with oats. There is a growing recognition of the value of such practices.

The following table gives the rainfall at a number of centres for the fallow and growing periods:—

RAINFALL.

Place.	Fallow Period.	Growing Period.
Quirindi	909	513
Warrah (W. Smith)	331	692
Loomberah (J. Lye)	754	444
Parkville	500	550
Currabubula	1,148	797
Duri	707	782
Manilla	752	755
Barraba	360	745
Warrah (G. Roworth)	271	639

Notes on the Plots.

Quirindi.—Wheat had been grown each season for some years; in 1925 cereals were fed-off in October. The soil is a deep self-mulching loam of sedimentary formation. The cultivations, per medium of the modern spring-tine cultivator drill, were early in March 2 to 3 inches deep (no moisture being visible), 4 inches deep in the latter part of April, and again 3½ inches during the first two days of June, when the soil was moist. Sown on 15th or 16th June in a moist seed-bed, wheat at 56 to 58 lb. and the oats at 44 to 66 lb. per acre (44 lb. of oats gave a satisfactory cover).

The Canberra wheat in the fertiliser trial was not treated for bunt prevention; a fair sprinkling of bunted ears occurred. No bunt was noticed in any variety that had been treated with copper carbonate dust. Throughout a slight reduction in yield was caused by either foot-rot or take-all fungi.

The plots were harvested with an old-time harvester, and a crop of Mulga oats which had lodged was lost.

Loomberah (J. Lye).—In 1925 the land was sown to wheat without fertiliser, but the crop failed. Early December ploughed 3 to 4 inches deep, scarified 3 inches deep on four occasions. Sown during the first week of June. Florence shelled badly, estimated at 7 bushels per acre; Waratah and Canberra lost in this way 1½ bushels.

Winton-road, Tamworth.—Soil a light red friable loam, mostly of shale formation. In 1924 barley was sown for sheep feed and fed off early in the spring; in 1925 barley was sown and grain harvested; both crops were unfertilised. Skim ploughed 3½ inches deep in December, 1925; three times springtined about 2½ inches deep and twice harrowed between ploughing and sowing. Plots sown 18th and 19th May at about 50 lb. seed for wheat and 60 lb. for oats. Superphosphate at approximately 60 lb. per acre was applied.

Three Seas and Watchman, supplied from Queensland, are early-maturing sorts; no disease was noted in Three Seas and only a rare case of flag-smut in Watchman. They did not compare favourably with the others tested, being too early and lacking vigour. Aussie lodged most, chiefly on the richer pockets of black-brown soil; the straw of Firbank was weak and this variety also lodged a little.

Bena Wheat on the Farm of Mr. W. Smith, Warrah.
Yield, 39 bus. per acre.

Warrah (W. Smith).—Soil is a brown-black clay loam of basaltic origin, self-mulching. Wheat without fertiliser in 1925, generally a failure. Ploughed with stump-jump mouldboard plough 4 to 4½ inches deep 15th to 20th April; springtoothed 2½ to 3½ inches 5th and again 27th May. Sown 28th May in a moderately moist seed-bed, but at somewhat uneven depth, as land was cloddy and the seeder was a disc drill; generally 1½ inches deep. Rate of seeding, wheat 46 to 52 lb., oats to 70 lb. per acre. The fertiliser was broadcasted by hand for the fertilised section of the experiment. Harrowed after sowing; crop fed-off with sheep 27th to 29th July. The oats lodged a little—Lachlan least—and the wheats likewise, Florence and Aussie being the most affected, especially in the black soil portion.

The heavy yields are attributed mainly to the opportune rainfall in September (when there were two falls, 105 and 250 points respectively). The fertiliser trial was completed, but comparable yields were not obtained.

Warrah (G. Roworth).—The soil is a red loam of basaltic and altered sandstone formation with darker patches. The experiment crop is the fourth since land was cleared. Wheat in 1925, unfertilised; fed-off in late spring, too poor to harvest. Ploughed 4 inches deep during the first week of May, followed by a springtine cultivation. Sown 27th and 28th May with a springtine cultivator drill about 2 inches deep, the seed-bed being moist. The rate of seeding was wheat 50 lb. and oats 40 lb. per acre. Sunrise oats lodged slightly. There was a mild attack of take-all and foot-rot which reduced the yield, chiefly by causing pinched grain.

Parkville.—The soil is a loam interspersed in part with water-worn stones. The subsoil is of a clay nature with satisfactory water-holding capacity. The land has been cropped for many years; in 1925 an unfertilised crop of wheat was grown. Ploughed, April-May, 5 inches deep; spring-toothed 22nd May, 5 inches deep (a portion cross-cultivated), harrowed directly after; springtoothed 4 inches deep on 15th and 16th June. Sown on the 17th and 18th June at the rate of 55 to 70 lb. per acre; the seed-bed was moist and somewhat set down by excessive rain and soakage from higher land. This water-logging caused stunted and sickly growth on a wide cross section, materially reducing the yield.

The very dry spring accentuated the ill effects of the water-logged section. The Sunrise oats section was cut for hay and yielded approximately 2 tons per acre.

Duri—The plots were located on high land with a slight slope to the east. The soil is a self-mulching fertile red clay loam, characteristic of a considerable area of the country in the Tamworth district. In 1925 the area was not cropped, but grew a fair amount of herbage, mainly trefoil, thistles, and other weeds. Ploughed 4½ inches deep with a disc implement late in December, 1925; cultivated with a springtine cultivator to depth of ploughing late in March (after the good rains); again cultivated late April 3 inches deep. Sown 3rd and 4th May 1½ inches deep in moderately moist soil at the rate of 42 to 48 lb. wheat, 1 to 1½ bushels of oats, and ¾ to 1 bushel of barley per acre, and harrowed shortly after. The high winds caused an amount of "shatter" and lodging in small portions of the crop.

The trial of malting barleys resulted as follows:—Trabut, 43 bushels per acre; Pryor, 23 bushels per acre.

Currabubula.—Red, basaltic soil. Wheat has been grown for some years without fertiliser; in 1924 an unfertilised crop of wheat was harvested and sheep run in the paddock from time to time, until the 1926 crop was sown. Ploughed latter part of December 5 inches deep. March rains produced over-consolidation, and re-ploughing was carried out during first week of May 3½ to 4 inches deep, followed by a harrowing. Sown 7th and 8th May

2 inches deep in a fairly moist seed-bed (a heavy chain being trailed) at rates ranging from 45 to 52 lb. per acre for the wheat and 40 lb. for the oats.

Manilla.—Plots located on a free working red loam with good water-retentive subsoil. Wheat has been grown for several years on the area, and in one year during the past five winter fodder crops. The 1925 wheat crop, unfertilised, yielded poorly, mainly due to dry weather. Ploughed January with disc plough 4 to 5 inches deep, when soil was moist; springtined 3 inches deep on 29th March, about a fortnight after good rain. Sown 29th April with a springtine drill cultivator (combine) in a moist seed-bed, the wheat at 55 lb. and the oats at 45 lb. per acre. The crop was fed-off from 22nd June to 6th July, the Sunrise oats being eaten bare before the sheep took to the wheat. All the wheat varieties shed grain due to the wind, the least affected being Binya and Union. It was estimated that an all-round loss of 3 bushels of wheat per acre occurred from this cause.

Wilfred was sown in a fertiliser trial, the seed being treated with formalin solution. The crop was affected, about 40 per cent. with flag-smut throughout, and the plots were not harvested separately.

Tintinhull.—Plots were situated on granitic country, the soil a grey sandy loam. Ploughed with disc early January and again in February; in mid-March a third cultivation with mouldboard plough was performed.

Superphosphate at the rate of 60 lb. per acre was applied with the seed. A profitable response from this fertiliser occurs each season on this class of soil.

Barraba.—The plots were situated on high basaltic country sloping slightly to the west. The soil is variable, black to grey in colour, very crumbly (self-mulching) in parts and very fertile. The preceding crop was oats, which was fed-off. Mouldboard ploughed 4 inches deep mid-February, the soil being slightly moist; springtoothed 19th April 3 inches deep. Sown 2 inches deep with a drill in a moist seed-bed 27th and 28th April and harrowed directly after. Algerian oats was sown in the fertiliser trial at 50 lb. per acre and in the variety trial at from 50 to 77 lb. The fertilised plots, especially the P5 plot, made most growth in the early stages.

The results of the fertiliser trials with oats (Algerian) were as follows:—

Superphosphate (222 lb. per acre)	19 bus.
P5 (140 lb. per acre)	17 bus.
Unmanured	16 bus.

Loomberah (W. Lye).—Country sloping to the north; soil red to brown loam of shale formation. Previous crop, wheat unfertilised; a poor crop, failed entirely on the section of self-mulching soil. Springtine cultivated 3 inches deep in February, 1926, to destroy a thick crop of young wild oat plants; similar cultivations in April, when a further crop of wild oats was destroyed, and again during the first week of May, additional oats being destroyed. Yandilla King and Waratah were sown 1st May and all except

Nabawa on the 17th May. Nabawa was sown on the 22nd June. A good plant cover resulted from the seeding of 43 to 56 lb. per acre. Considerable loss (in Waratah especially) occurred from shatter.

RESULTS of Oat Variety Trial.

Variety.	Quirindi.	Warrah. (W. Smith.)	Winton Road, Tamworth.	Warrah. (G. Roworth).	Duri.	Currabubula.	Manilla.	Barraba.	Loomberah. (W. Lye.)
Belar	24	29	...	...	...	30	...	...	...
Mulga	23	...	...	40	23	...	...	14	...
Lachlan	...	46	...	...	...	...	...	9	22
Sunrise	...	...	12	25	...	...	13	8	...
Guyra	...	...	...	...	30	...	...	...	...
Algerian	...	...	...	...	...	...	...	16	...
Myall	...	...	...	...	...	...	...	12	18

RESULTS of Wheat Variety Trial.

Variety.	Quirindi.	Warrah. (W Smith)	Loomberah (J. Lye).	Tamworth.	Warrah (G. Roworth)	Parkville.	Duri.	Currabubula	Tintinhull.	Manilla.	Loomberah (W Lye)
Clarendon	23	...	15	23	27	16	26	20	13	16	...
Currawa	17	...	21	...	39	...	...	...	...	...	...
Waratah	23	...	23	...	...	...	...	32	14	...	25
Aussie	23	42	...	29	...	...	33	...	...	24	20
Ranee	24	...	...	...	...	...	...	32	...	...	...
Binya	24	...	...	...	33	23	...	...	14	19	...
Canberra	26	42	25	...	...	16	27	24	...	...	...
Firbank	...	32	...	18	...	...	...	...	...	...	...
Florence	...	34	14	...	...	...	...	...	...	...	...
Bena	...	39	20	...	...	31	...	...	15	...	26
Wandilla	...	...	24	...	...	...	...	...	...	...	...
Yandilla King ...	...	...	23	27	37	15	25	...	...	20	25
Wilfred	...	...	25	...	...	...	...	...	...	...	...
Pusa No. 4	...	...	24	...	...	...	...	...	...	...	26
Canimbla	...	...	29	43	...	...	...	33	...	...	15
Rymer	...	...	23	...	...	...	...	...	...	...	...
Union...	...	...	26	...	...	...	...	34	...	19	26
Duri	...	...	23	...	..	...	...	...	...	...	...
Barwang	...	...	...	27	...	...	...	...	...	...	...
Turvey	...	...	...	23	...	...	...	28	...	...	...
Watchman	...	...	...	18	...	...	...	...	...	...	...
Three Seas	...	...	...	14	...	...	...	...	...	...	...
Gresley	...	...	...	...	...	22	...	...	13	20	...
Rajah...	...	...	...	...	...	...	23	...	...	20	...
Cadia	...	...	...	...	...	...	23	30	...	...	22
Federation	...	...	...	...	...	...	30	...	...	...	...
Penny	...	...	...	...	...	...	33	...	...	...	...
Nabawa	...	...	...	...	...	...	...	...	...	...	24

RESULTS of Fertiliser Trial with Wheat.

Fertiliser per Acre.	Quirindi.*	Warrah † (G. Roworth).	Parkville.*	Duri.*	Currabubula.*	Loomberah.‡ (W. Lye.)
	bus.	bus.	bus.	bus.	bus.	bus.
Superphosphate 67 lb. ...	25¼	...	...	...	...	...
,, 84 lb. ...	...	33	...	...	23	16
,, 94 lb. ...	...	...	...	26⅓	...	...
,, 168 lb. ...	...	...	19	...	...	...
P5§ 99 lb.	...	...	...	28	...	...
,, 100 lb.	...	...	16	...	...	...
,, 105 lb.	...	33	...	...	24	17
No manure	26	35	16	26½	24	16

* Canberra Variety. † Currawa. ‡ Yandilla King.
§ P5 consists of four parts superphosphate and one part of sulphate of potash

RATE of Seeding Trial (Canberra Variety).

	Duri.	Currabubula.
	bus.	bus.
Seed per acre 32 lb.	......	24
,, 40 lb.	25	......
,, 50 lb.	26	23
,, 60 lb.	26	......

North-western District.

C. McCAULEY, Agricultural Instructor.

The following branches of the Agricultural Bureau co-operated with the Department in establishing experiment and pure seed plots :—

- Nullamanna.
- Oakwood and Mt. Russell (combined).
- Myall Creek.
- Mt. Rodd.
- Pallamallawa.
- Eulah Creek.
- Wee Waa.
- Nandewar.
- Willala.
- Dunnadee Creek.
- Nobby Rock.
- Basin Plain.
- Nea Siding and Carara (combined).
- Emerald Hill.
- Hall's Creek.

Plots were also conducted on private farms in the following districts :—

- Pilliga.
- Bellata.
- Boggabri.
- Ashley.

The Season.

The season was exceptionally dry between September, 1925, and March, 1926. Good rains fell during March between Bellata and Curlewis; this enabled the farmers to work their land and obtain a good seed-bed. The districts between Moree and Inverell failed to get this rain. Good rains fell

during April and May, which caused a good germination, and gave the plants a good start. The totals for June and July were far below the average and dry weather accompanied by heavy frosts was experienced during August and September, and seriously checked the plants. Hot, dry weather, accompanied by heavy winds set in during October and caused the plants to ripen prematurely, but a good sample of grain was obtained.

The Wheat Variety Trials.

The following are brief particulars concerning the 1926 plots:—

Oakwood and Mount Russell Bureau.—F. Rainger, Mount Russell: Soil, red loam; ploughed 14th–28th February, disc cultivated 26th–30th May; sown 4th June; seed 45 lb. per acre.

Myall Creek Bureau.—A. M. M. Paterson, Delungra: Soil, black volcanic; ploughed January, springtooth cultivated February, May, and June, harrowed June; sown 11th and 12th June; seed 45 lb. per acre.

Pallamallawa Bureau.—Cosh Bros., Pallamallawa: Soil, chocolate loam; ploughed January, cultivated three times; sown 26th May; seed 45 lb. per acre.

Eulah Creek Bureau.—R. Smith, Eulah Creek: Soil, dark loam; ploughed January, cultivated three times; sown 4th May; seed 45 lb. per acre.

Wee Waa Bureau.—N. W. Webb, Wee Waa: Soil, black to chocolate loam; ploughed December, 1925, cultivated twice in January, 1926, and once in April; sown 30th April; seed 44 lb., superphosphate 32 lb. per acre.

Nandewar Bureau.—W. K. Campbell, Maules Creek: Soil, light loam; ploughed August, 1925, cultivated December, 1925, February and April, 1926; sown 19th May; seed 45 lb per acre.

Willala Bureau.—Clark Bros., Willala: Soil, red sandy loam; cultivated December, 1925, January and April, 1926, not ploughed; sown, 29th May; seed 45 lb. per acre.

Nullamanna Bureau.—W. S. Rickey, Nullamanna: Soil, red loam; ploughed October, 1925; sown with maize, which failed; skim ploughed April, 1926; sown, 23rd June; seed 60 lb. per acre.

Dunnadee Creek Bureau.—D. M. Leys, Mullaley: Soil, red clayey loam; ploughed January, cultivated March and April; sown 7th May; seed 50 lb. per acre.

Nobby Rock Bureau.—L. Pryor, Gunnedah: Soil, heavy chocolate; ploughed October, 1925, cultivated when necessary; sown, 15th June, 1926; seed 45 lb. per acre.

Basin Plain Bureau.—C. Beeson, Gunnedah: Soil, chocolate loam; springtooth cultivated in December and twice in April, not ploughed; sown 19th May; seed 45 lb. per acre.

Nea Siding and Carara Branches of the Bureau.—W. O. Manning, Curlewis: Soil, heavy clay basalt; ploughed November, 1925, cultivated January twice February and April; sown, 1st May, 1926; seed 45 lb. per acre.

YIELDS of Wheat Variety Trials.

	Nullamanna Bureau.	Oakwood and Mt. Russell Branches of Bureau.	Myall Creek Bureau.	Pallamallawa Bureau.	Eulah Creek Bureau.	Wee Waa Bureau.	Nandewar Bureau.	Willala Bureau.	Dunnadee Creek Bureau.	Nobby Rock Bureau.	Basin Plain Bureau.	Nea Siding and Carara Branches of Bureau.	Emerald Hill Bureau.	Pilliga.	Bellata.	Boggabri.	Ashley.
	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.
Clarendon	8 24	10 49	3 13	15 2	18 57	24 21	17 30	18 59	16 30	25 43	18 4	16 49	21 46	19 11	20 0	...	16 40
Gresley	7 27	12 6	5 44	13 7	20 50	32 25	15 0	20 4	13 30	23 9	14 24	23 26	30 54	10 35	17 26	15 0	17 0
Aussie	6 38	12 17	4 2	17 45	27 23	...	24 21	28 56	13 30	33 8	21 6	27 44	31 11	18 45	27 0	40 2	19 40
Bena	5 24	10 14	6 29	13 24	22 32	...	18 21	22 50	12 0	24 44	22 16	28 8	30 16	21 7	29 28	25 39	21 30
Canimbla	4 37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Turvey	4 0	...	7 10	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Union	3 24	11 50	5 30	14 19	18 58	...	18 10	15 1	18 0	18 27	15 0	27 11	28 3	18 27	21 0	22 50	19 10
Three Seas	3 24	17 30	6 36	16 28	...	...	...	...	...	...	...	...	...	...	...	...	...
Watchman	2 57	9 47	9 21	20 22	...	...	...	...	...	...	...	...	...	...	...	...	...
Cleveland	...	7 50	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hard Federation ...	...	...	...	...	18 57	...	...	...	...	...	...	...	...	...	...	...	...
Nabawa	...	...	...	...	...	...	25 50	...	...	...	...	...	...	...	...	...	...
Rajah	...	...	...	...	...	...	23 35	...	...	...	16 0	...	...	...	...	...	...
Ranee	...	...	...	...	...	...	21 48	...	...	...	15 45	...	...	...	...	...	...
Barwang	...	...	...	...	...	...	...	...	...	20 18	...	...	...	...	...	...	...
Currawa...	...	...	...	...	...	...	...	...	...	15 40	...	...	...	...	...	...	...
Duri	...	...	...	...	...	...	...	...	...	...	46 54	...	30 35	...	...	...	...
Binya	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	24 7	...
Waratah	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	26 10	...
Bobin	...	...	...	...	...	...	...	...	...	...	45 22	...	...	...	...	...	...
Early Bird ...	...	...	...	...	...	...	...	...	...	...	45 0	...	...	...	...	...	...
Boolaroo ...	...	...	...	...	...	...	...	...	...	...	29 26	...	...	...	...	...	...
Thew	...	...	...	...	...	...	...	...	...	...	21 0	...	...	...	...	...	...

Emerald Hill Bureau.—W. McDonald, Emerald Hill: Soil, chocolate loam; ploughed December, 1925, cultivated when necessary; sown 20th May; seed 45 lb. per acre.

Pilliga.—J. Miller-Williams: Soil, red loam; ploughed January, cultivated April; sown 7th May; seed 60 lb. per acre.

Bellata.—A. E. Philp: Soil, red loam; ploughed December, 1925, cultivated April; sown 1st May; seed 45 lb. per acre.

Boggabri.—R. A. Studd: Soil, chocolate loam; ploughed August, cultivated when necessary; sown 18th May; seed 45 lb. per acre.

Ashley.—J. H. McDonald: Soil, chocolate loam; cultivated November, 1926, harrowed December, springtoothed January, February, and April; sown 31st May; seed 48 lb. per acre.

Pure Seed Plots of Wheat.

The following are brief cultural details:—

Oakwood and Mount Russell Branches of Bureau.—F. Rainger, Mount Russell (Canberra): Soil, red loam; ploughed 14th–22nd February, 1926, disc cultivated 26th–30th May; sown, 4th June; seed 45 lb. per acre.

G. Anderson, Oakwood (Waratah): Soil, chocolate loam; seed-bed well worked, short fallow; sown 14th June; seed 60 lb. per acre.

J. R. Hatcher, Oakwood (Clarendon): Soil, heavy black; ploughed February, harrowed and skim ploughed; sown 28th May; seed 60 lb. per acre.

J. Spinks, Mount Russell (Cleveland): Soil, chocolate loam; well worked short fallow; sown 15th May; seed 50 lb. per acre.

Myall Creek Bureau.—A. M. M. Paterson, Delungra (Clarendon): Soil, black volcanic; ploughed September, cultivated December, January, May and 1st June; sown 1st June; seed 45 lb. per acre.

H. A. Sutherland, Delungra (Florence): Soil, black volcanic; ploughed January, skim ploughed early February; sown 12th June; seed 53 lb. per acre.

F. H. Squire, Delungra (Cleveland): Failed.

J. W. Milgate, Delungra (Waratah): Soil, black volcanic; ploughed December, 1925, cultivated March and April; sown 18th May; seed 45 lb. per acre.

Wee Waa Bureau.—F. C. Collett (Marshall's No. 3): Soil, red loam; ploughed October, and kept well worked until sown on 10th May; seed 60 lb. and superphosphate 50 lb. per acre.

J. L. Cherry (Hard Federation): Soil, chocolate loam; ploughed 26th November, 1925, cultivated December, January and April; sown 30th April; seed 45 lb. per acre.

J. Davis (Clarendon): Land ploughed January, cultivated when necessary; sown 28th May; seed 60 lb. per acre.

T. Sweetman (Waratah): Land ploughed December, cultivated January and March; sown 1st May; seed 45 lb. per acre.

Nandewar Bureau.—W. K. Campbell (Canberra and Clarendon): Ploughed August, 1925, cultivated December, February and April; sown 19th May; seed 45 lb. per acre.

H. Gallagher (Marshall's No. 3): Chocolate loam; ploughed January, harrowed February and May; sown 14th May; seed 41 lb. per acre.

A. Holmes (Waratah): Light loam, clay subsoil; ploughed December, harrowed January, cultivated February and March; sown 24th May; seed 45 lb. per acre.

Willala Bureau.—A. W. Donaldson (Hard Federation): Soil, red sandy loam; springtoothed December, disced April; sown 21st May; seed 30 lb. per acre.

F. Shaw (Canberra): Disced January, harrowed March, cultivated April and May; sown 25th May; seed 48 lb. per acre.

Sanderson Bros. (Clarendon): Soil, sandy loam; ploughed October, disced February, cultivated March; sown 19th May; seed 45 lb. per acre.

J. Haire (Wandilla): Soil, red sandy loam; ploughed January, cultivated April; sown 8th May; seed 45 lb. per acre.

Dunnadee Creek Bureau.—K. Leys (Waratah): Soil, red loam; ploughed April, cultivated and harrowed May; sown 5th May; seed 45 lb. per acre.

Green and Gregg (Clarendon): Ploughed April, cultivated May and June; sown 5th June; seed 60 lb. per acre.

D. M. Leys (Wandilla): Failed.

G. B. Tait (Canberra): Ploughed, cultivated and harrowed April; sown 1st May; seed 45 lb. per acre.

Nobby Rock Bureau.—R. Worboys (Waratah and Wandilla): Soil, heavy loam; ploughed January, cultivated April and May; sown 20th May; seed 45 lb. per acre.

T. S. Bowden (Clarendon and Canberra): Soil, sandy loam; ploughed December, cultivated when necessary; sown 28th May; seed 48 lb. per acre.

Basin Plain Bureau.—C. Beeson (Clarendon and Waratah): Soil, red loam; cultivated November and March; sown 7th May; seed 45 lb. per acre.

O. Orminstone (Canberra): Soil, red loam; ploughed February, skim ploughed April, cultivated May and June; sown 10th June; seed 45 lb. per acre.

Nea Siding and Carara Branches of the Bureau.—L. Hathway and Son (Canberra): Soil, chocolate loam, cultivated June, 1925; sown with fodder crop which was fed off; ploughed August, cultivated October and January harrowed May; sown 18th May; seed 38 lb. per acre.

W. O. Manning (Waratah): Soil, chocolate loam; ploughed December, cultivated twice; sown 3rd May; seed 40 lb., high-grade superphosphate 40 lb. per acre.

Cope and Phillips (Marshall's No. 3): Soil, red loam; ploughed January and kept well worked until sown on 19th March; seed 45 lb. per acre.

Cope and Phillips (Clarendon): Soil, red gravelly loam; ploughed January, cultivated when sown on 19th May; seed 60 lb. per acre.

Emerald Hills Bureau.—Greer and Boddington: Soil, chocolate loam; cultivated December, 1925, harrowed April, disced May; sown 20th May; seed 40 lb., superphosphate 40 lb. per acre.

W. McDonald (Duri and Marshall's No. 3): Soil, red loam; ploughed January, harrowed March and April; sown 20th May; seed 40 lb. per acre.

F. Shaw (Canberra): Soil, black; ploughed January, harrowed March, cultivated April and May; sown 25th May; seed 48 lb. per acre.

W. Tunningley (Clarendon): Soil, red loam; ploughed December, cultivated March; sown 21st May; seed 45 lb. per acre.

YIELDS of Pure Seed Wheat Plots.

	Oakwood and Mt. Russell Branches of Bureau.	Myall Creek Bureau.	Wee Waa Bureau.	Nandewar Bureau.	Willala Bureau.	Dunnadee Creek Bureau.	Nobby Rock Bureau.	Basin Plain Bureau.	Nea Siding and Carara Branches of Bureau.	Emerald Hill Bureau.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Canberra	13 6	...	..	54 0	20 0	21 0	31 20	21 14	30 0	16 0
Waratah	21 0	18 0	21 14	22 12	...	25 10	25 15	29 7	29 0	..
Cleveland	14 0	Failed.	...	...	..	..	...	...	...	..
Clarendon	15 45	13 0	18 0	21 4	19 30	9 0	21 2	18 33	16 0	24 10
Florence	..	9 0	.	...	..	..	...	...	...	...
Marshall's No. 3 ..	...	...	36 0	24 0	..	...	...	22 10	35 5	31 27
Hard Federation ..	...	...	25 20	...	20 46	...	...	...	...	.
Wandilla	...	...	...	...	25 0	Failed.	25 30	...	...	..
Duri	...	...	...	...	..	...	...	...	...	30 35

Thick and Thin Seeding Trials.

Emerald Hill Bureau.—J. Kruse: Soil, sandy loam; ploughed January, cultivated April; sown, 1st May, 1926. Variety, Hard Federation.

Nea Siding and Carara Branches of the Bureau.—Wood Bros.: Soil, chocolate loam; disced December, cultivated January and April; sown 5th May, with 40 lb. high-grade superphosphate. Variety, Waratah.

RESULTS of Rate of Seeding Trial.

Rate per acre.	Emerald Hill Bureau.	Nea Siding and Carara Branches of Bureau.	Myall Creek Bureau.	Nandewar Bureau.	Dunnadee Creek Bureau.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
30 lb.	16 5	42 18	10 9	20 30	12 14
40 ,, ...	......	43 52	......	......	......
45 ,, ...	19 23	......	7 53	22 30	15 10
50 ,, ...	......	46 3	......	......	......
60 ,, ...	16 47	......	5 23	19 30	12 0
70 ,, ...	19 4	46 22	......	......	......

The results of the trials appear to favour 45 lb. per acre; this amount is in general use.

Myall Creek Bureau.—A. M. M. Paterson: Ploughed January, kept well worked until sown on 20th May. Variety, Clarendon.

Nandewar Bureau.—S. A. Morris: Soil, sandy loam; cultivated January, March and April; sown 22nd May. Variety, Hard Federation.

Dunnadee Creek Bureau.—D. M. Leys: Soil, red clayey loam; ploughed January, cultivated March and April; sown 15th May. Variety, Canberra.

Time of Sowing Trials.

Nandewar Bureau.—A. Holmes: The April-sown plot was ploughed January, harrowed February, cultivated April; sown 13th April at 45 lb. seed per acre.

The May-sown plot was treated as above, then disced in May and sown on 20th May; seed at 45 lb. per acre.

The June plot received the same treatment, and was sown on 6th June; seed at 45 lb. per acre.

Variety, Hard Federation.

Dunnadee Creek Bureau.—D. M. Leys: The May-sown plot was ploughed January, cultivated March and April; sown 15th May; seed at 45 lb. per acre.

The June plot received the same treatment, and was sown on 15th June; seed, 45 lb. per acre.

Variety, Canberra.

The results were as follows:—

Time of sowing.	Nandewar.			Dunnadee Creek.	
	bus.	lb.		bus.	lb.
April	9	0	(frosted).	......	
May	19	30		15	10
June	16	36		9	0

Notes on Varieties.

Waratah and Canberra are the most popular varieties in the North-west. Waratah is a heavy yielder in all classes of soil; it is subject to rust, but yielded well during the wet season of 1924, the dry one of 1925, and the medium one of 1926. It has rather weak straw, but combs up well; it shelled badly this season. Canberra yields well, but has very weak straw, and is subject to rust, flag smut, and loose smut. It will probably be replaced by Duri. Both Duri and Aussie yielded well on all classes of soil, they have short straw, which is rather weak, though Duri is much stronger than Canberra and is not so subject to loose smut. There is a big demand for seed of these varieties.

Marshall's No. 3 when sown early yielded well, but will later be replaced by Bena (unless this variety is very subject to rust). Marshall's No. 3, Turvey, Canimbla, and Wandilla, are of too late maturity for an ordinary season in this district.

Rajah, Ranee, Three Seas, and Watchman, promise well on this season's results. Union is giving satisfactory yields in places, but is subject to rust. Nabawa yielded well at Nandewar and is resistant to flag smut. Gresley has been tried for several years, but is only suitable for hay.

Diseases.

Owing to the general use of dry copper carbonate, all the plots were free of bunt. All plots were more or less infected with foot-rot and flag smut and were especially bad with Hard Federation and Canberra, and the early-sown plots. Union was the only variety infected with rust; Nabawa and Wandilla were free of flag smut.

Oat Variety Trials.

The following are brief details of the plots:—

Oakwood and Mount Russell Branches of the Bureau.—A. Page: Soil, black to chocolate; sown with barley, 1925, failed and fed off; well worked until sown on 30th June at 40 lb. per acre.

Myall Creek Bureau.—Soil, black volcanic; ploughed June, 1925, cultivated several times; sown 5th June; seed 40 lb. per acre.

Mount Rodd Bureau.—E. Dufty: Soil, red loam; ploughed January, cultivated December, February, March and April; harrowed October; sown 6th June, seed 40 lb. per acre.

Wee Waa Bureau.—J. Newnham: Soil, red loam; ploughed August, cultivated until sown on 17th May; seed 40 lb. per acre.

Nandewar Bureau.—R. Tucker: Soil, chocolate loam; ploughed January, cultivated April and May; sown 29th May; seed 40 lb. per acre.

Willala Bureau.—R. McKenzie: Soil, chocolate loam; ploughed December, cultivated April; sown 26th June; seed 40 lb. per acre.

Dunnadee Creek Bureau.—G. B. Tait: Soil, red loam; ploughed April, cultivated and harrowed April; sown 1st May; seed 40 lb. per acre.

Nobby Rock Bureau.—B. M. Birrell: Soil, sandy loam; ploughed November, harrowed November, December, February, March and April; sown 15th May; seed 40 lb. per acre.

Basin Plain Bureau.—C. Beeson: Soil, red loam; disced November, cultivated March; sown 1st May; seed 45 lb. per acre.

Nea Siding and Carara Branches of the Bureau.—J. Cavanagh: Soil, red gritty loam; ploughed November, cultivated three times; sown 27th May; seed 40 lb. per acre.

Emerald Hill Bureau.—Greer and Boddington: Soil, red loam; disced December, cultivated January and March; sown 1st May; seed 40 lb. per acre. These plots lodged badly, and the results cannot be taken as comparable.

YIELDS of Oat Variety Trials.

	Oakwood and Mt. Russell Branches of Bureau.	Myall Creek Bureau.	Mt. Rodd Bureau.	Wee Waa Bureau	Nandewar Bureau.	Willala Bureau.	Dunnadee Creek Bureau.	Nobby Rock Bureau.	Basin Plain Bureau.	Nea Siding and Carara Branches of Bureau.	Emerald Hill Bureau.
	bus. lb.	bus. lb.	bus. lb.	bus. lb	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Lachlan ...	10 10	4 0	21 0	27 0	16 21	17 20	16 2	42 20	59 17	34 0	16 25
Mulga ...	19 10	16 0	18 4	18 35	21 16	7 10	21 16	46 26	27 30	20 9	17 0
Guyra ...	16 12	6 0	15 10	24 27	28 31	25 0	28 31	30 25	49 37	19 24	18 23
Belar ...	12 10	6 0	12 20	12 36	19 10	17 10	19 10	43 30	46 20	17 20	18 27
Myall ...	...	17 0	...	11 19	..	...	...	41 2	.	...	18 9

Pure Seed Oat Plots.

Pure seed oat plots were conducted by the following branches of the Bureau :—

Wee Waa Bureau.—J. Newnham : Soil, red loam; ploughed January, cultivated several times; sown 5th June; seed 40 lb. per acre.

Nandewar Bureau.—W. K. Campbell: Soil, red loam; ploughed December, cultivated several times; sown 20th May; seed 40 lb. per acre.

The results were as follows :—

Variety.	Wee Waa.	Nandewar.
	bus. lb.	bus. lb.
Guyra	27 7	......
Mulga	......	67 20

Feeding-off Trials with Oats.

Feeding-off trials with oats were conducted in conjunction with Carara and Nea Siding Branches of the Bureau :—

L. Hathway and Son (variety, Guyra) : The land was ploughed the middle of June, 1925; sheep were run on the fallow; seed was sown on the 29th March, 1926, at the rate of 31 lb. per acre, and the land harrowed immediately afterwards. Fed-off the middle of May with fifty sheep per acre for five days; again the middle of June for the same period. Portion was cut for silage in second week of October; yield, 12½ tons of green stuff per acre. Remainder harvested for grain 22nd November; yield, 24 bushels per acre, but crop had shelled badly owing to over-ripeness.

Stanger Bros. (variety, Mulga) : The land was ploughed in January, and sown in March at the rate of 40 lb. per acre. On 90 acres 520 ewes lambed and fattened. A portion was fed-off on the 1st August, and later allowed to produce a hay crop which cut 30 cwt. of good quality hay per acre. The remainder stripped 36 bushels per acre.

Winter Fodder Trials.

Winter fodder trials were conducted by Mr. A. Johnson, of Myall Creek Bureau, and Messrs. Green and Gregg, of Dunnadee Creek Bureau. These plots yielded good winter feed, but did not make sufficient growth to harvest.

The Better Farming Train.

The Better Farming Train has been working in the North Coast district during the last few weeks, and at the twelve centres at which stops were made between the Hunter River and the Clarence every section of the train was crowded with enthusiastic seekers for information. The latest methods of cultivation, improved varieties of potatoes, maize, and broom millet, and many other matters of special interest to coastal farmers have been the subject of numerous inquiries.

The dairying section in particular attracted much attention, visitors being closely interested in the display of up-to-date utensils, and in the advice freely given by members of the train staff about the many factors which enter into the production of high class cream and butter. It is hoped that, as a result of the striking manner in which herd improvement is dealt with in this section, a much greater number of dairy stock will be tested in future, and that the position of dairy farmers who have found the margin between cost of production and market price all too small in the past will be greatly improved thereby.

The first North Coast tour terminated at South Grafton, and the second tour will commence on the north side of the river at Grafton on 21st June. The itinerary of the tour will be as follows:—

Grafton, June 21, 22.	Casino, June 25, 27.	Byron Bay, July 1, 2.
Rappville, June 23.	Lismore, June 28, 29.	Mullumbimby, July 4.
Kyogle, June 24.	Bangalow, June 30.	Murwillumbah, July 5, 6.

Many requests have been received for the train to stop at other stations, but the Director (Mr. A. H. E. McDonald) points out that the demands from all districts throughout the State for the train's services are so insistent that it is impossible to prolong the itinerary. Farmers and stockowners within reach of the stations at which stops are to be made should therefore make every endeavour to visit the Better Farming Train while it is in their own districts.

To Increase the Wheat Yield.

It is becoming more clearly recognised that little advance can be expected in the maximum yield of wheat varieties, that marked increase of yields is not likely to result from any innate ability of new varieties to yield more than those of to-day. Increases will come on the one hand from better cultural methods, and on the other from the reduction of losses due to climatic factors and pests. The object of plant breeders to-day is not so much to produce more heavily-yielding wheats as to secure varieties capable of producing good crops of good quality grain under our average climatic conditions, and at the same time resistant to the diseases to which wheat is here liable.—W. M. Carne and E. J. Limbourn, in the *Journal of Agriculture,* W.A.

Fallowing Competitions, 1926-27.

SOME OF THE JUDGES' REPORTS.

WESTERN DISTRICT (PARKES CENTRE).

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

During the period of 1926–27, fallow competitions were promoted by the P. and A. Associations of Forbes, Parkes and Bogan Gate, and the Agricultural Bureau of Murrumbogie.

The excellent crop results secured by the leading competing farmers in the fallow competitions of past years have awakened a desire in the general farming community to learn something more about the finer points of the business of growing wheat, with the result that two additional centres promoted fallow competitions this year. A pleasing feature of the judging was the interest shown by competitors at Bogan Gate and Murrumbogie, where the judging partook more after the nature of field demonstrations, many farmers (from fifteen to twenty) following the judge throughout the inspections The method by which their interest was sustained is explained in the report of the Murrumbogie contest.

The Seasonal Conditions.

The prolonged heavy rains of March, April and May, 1926, and the frequent light falls of June and July, kept the ground too wet for early fallowing. Less than average rainfall occurred from June to November. Good rains of 4 and 5 inches in December and January enabled the fallows to be placed in good condition, and average falls in March maintained a moist condition near the surface.

The Parkes Competition.

The winner of the Parkes competition scored 148 points out of a possible 150. The fallow placed second scored 147; three fallows were awarded 144, one 142, and two 141. Eight of the seventeen fallows scored 141 points each, or over. The awards of 148 and 147 points are of interest and are worthy of comment, as they are the highest awards yet made in the State.

Mr. C. R. McGrath, of Goonumbla, was awarded first place for a fallow of chocolate clayey loam country, of self-mulching type. It was mouldboard ploughed 3 inches deep in August, 1926, springtooth cultivated (with combine) in October, December, twice in January, and once in February; harrowed twice in March immediately after rain, and springtoothed in March. The land had been worked eight times.

Mr. E. J. Johnson, of Wongalea, who secured second place, showed a fallow on chocolate loam to clayey loam country, which was mouldboard ploughed in July, 1926; harrowed September; disc cultivated October; springtooth cultivated December, twice in January, once in February and March, and then lightly harrowed. The land had been worked eight times.

As the awards suggest, both fallows were practically ideal; a mulch of correct texture and depth, nicely ripened and mellow, covered a moist well-compacted sub-surface soil. The moisture content was excellent to a depth of 2 feet, and not one weed was noticed on either of the fallows. Special attention had been given to the finishes, and it was not possible to detect them. Headlands had been cultivated close to the fences, thus lessening the weed problem and future fire danger.

The outstanding feature of the competition is, perhaps, the number of workings which the fallows received; the seven leading fallows averaged 7·14 workings, excluding the ploughing; the supplementary ten fallows averaged 4·7, and the average of the seventeen fallows was 5·7. As each fallow will probably receive one more working and then be sown with a combine, these figures may reasonably be increased by two.

It is interesting to refer to some of the results brought to light by the 1926–27 crop competition at Parkes. The land producing the seven leading crops was worked 6·6 times, and gave an average yield of 38·6 bus. per acre; the next twelve crops were worked 4·75 times, and gave an average yield of 29·25 bus. per acre; the average of all the crops (nineteen) was 5·43 workings, and the average yield 32·7 bus. per acre.

The first fallow competition was promoted here in 1924, and it was then considered by the majority of farmers that four workings was the maximum that could profitably be employed. Each year the number has been increased, and it is now generally recognised to be almost impossible to place a fallow in really good condition with less than seven workings.

There is still some doubt in the minds of many as to whether such frequent workings are profitable. Some guide is given by the above figures, two additional workings helping to increase the yield by more than 9 bushels per acre. Such increased workings and the consequent better condition of the fallow allows for heavier manuring and seeding, which did actually influence the 9-bushel increase. All results of past years have stressed the importance of frequent workings, heavier seedings and manurings, and as all the recognised successful farmers are progressively increasing such factors it is surely " backing a winner " to go and do likewise.

Some outstanding effects of faulty working were brought prominently forward during the judging. It can definitely be stated that the summer rainfall is absolutely useless in augmenting the moisture content of soils in the western district to below a depth of 12 inches. Such rains may amount to 2 or 3 inches, but being of a heavy nature, surface run-off is great, and the

temperatures immediately following are high, and evaporation rapid. The only period when the subsoil to a depth of 2 feet can become wet is during the months of June, July and August, when rains are usually steady, temperatures low, and fallows in a rough condition. Fallows ploughed late, August-September, generally showed a diminishing moisture content below 12 inches, and the importance of June-July ploughing was forcibly illustrated.

The good rains of December and January, 4 and 5 inches respectively, gave an opportunity of storing maximum moisture to a depth of 12 inches, but where the January cultivation was delayed a distinct lessening in moisture to a depth of 6 inches was noticeable. The handling of the fallow after summer rains needs particular care, as any neglect is followed by a rapid lessening of moisture in the first foot of soil.

Last winter presented many difficulties when fallowing, owing to the wet condition of some lands. In cases where the ploughing was done in June and July, the land turned over in wet lumps, placing it out of condition. Upon drying, the lumps were hard and subsequent rains and workings failed to reduce them appreciably, making impossible the production of a ripe, mellow mulch. In such instances it would, perhaps, have been better to have chosen the lesser of two defects, and sacrificed subsoil moisture in favour of good soil condition, by waiting a little longer before ploughing.

Forbes Competition.

In the Forbes competition six entries were received, and the winner was Mr. D. L. N. Miller, with 141 points. Mr. F. Black was placed second with 129 points, the fallows being worked five and nine times respectively.

Bogan Gate Competition.

Three weeks before judging this association decided to promote a fallow competition, and it speaks well for the keenness of the district farmers that fifteen entries were received. The standard of the fallows was medium to good, and the number of the workings proved to be :—(*a*) of the seven leading fallows, 4·28; (*b*) of the whole of the fifteen fallows, 3·66. The awards for the seven leading fallows ranged from 122 to 134 points.

Comparing these figures with those of Parkes, a great difference is shown, and although a comparison is not in favour of the Bogan Gate fallows, it serves to illustrate the value of these competitions.

Four years ago, when Parkes promoted its first fallow competition, the fallows were on a par with the present day Bogan Gate fallows, but each year a substantial improvement has taken place. Further comparison may be made with the fallows at Murrumbogie, which is 20 miles west of Trundle; there the fallows are a step below Bogan Gate, and yet again the fallows at Albert are below those of Murrumbogie. It seems that the nearer the centres are to the activities of field competitions the higher is the standard of farming

With a continuance of this initial effort it will surely not be many years before the achievements of these centres will be advertised as a medium of encouragement to more distant localities.

The winner of the Bogan Gate competition proved to be Mr. W. Scott, who scored first and second places with awards of 134 and 132.

Murrumbogie Bureau Competition.

Full advantage of this competition was taken by members of the Bureau to learn as much as possible about the business of fallowing. Seven entries were received, and fourteen members of the Branch met on judging day at the first competing fallow on Murrumbogie homestead. Here the principles of fallowing were explained and demonstrated by the judge, who later detailed the method of judging and enumerated the points to observe when making comparisons between fallows. Each member then contributed 1s. towards a prize fund, and judging cards were distributed.

The first fallow was then inspected from a competitive point of view, and the loss of points for defects stated and explained by the judge. This award then served as a standard upon which the subsequent fallows were judged. Throughout the day each member judged and awarded points for each fallow. At the completion of the inspections, each section of the awards made by the members was compared with the awards made by the judge, and the member whose judgment showed the least difference was declared the winner. It was noteworthy that all members placed the first three fallows in the correct order of merit.

During the day the defects of late ploughing and of neglect of workings at certain periods were clearly demonstrated, and the opinion was unanimously expressed that the knowledge gained during the day was only made possible by taking part in a judging contest.

Ladies supplied a very enjoyable lunch and showed considerable interest in the day's work, and no doubt such matters as mulch, compactness, and moisture content will prove interesting topics in several homes out west. In the Bogan Gate competition a somewhat similar day was held among the members of the Gunning Gap Bureau, and several men who told their wives to expect them home for lunch evidently forgot their intentions, as they were still on the job at 6 p.m.

THE DUBBO COMPETITION.

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

It is gratifying to record an excellent entry of sixteen, and that the great majority of the fallows submitted for inspection were of high order. It was unfortunate that after judging had commenced, a rain storm, varying from a few points to over an inch in different localities, occurred, thus largely preventing the judge from viewing the work done by individual owners in

conserving moisture after a dry spell of six weeks, and also necessitating revisiting those fallows which had been inspected. However, only a few were particularly favoured, and it was not difficult to detect any difference made by the immediate rains. The general standard of most of the fallows inspected was high, pointing to the fact that entrants are keenly aware of the factors necessary to the production of an ideal seed-bed, namely, moisture conservation, consolidation or compaction of the sub-surface soil, a suitable cloddy mulch of not too great a depth, and freedom from weed growth.

The Season.

After an abnormally wet autumn in 1926, soil conditions were not good, and in many instances it was not possible to commence ploughing operations until well into the winter owing to delayed sowing operations, and soil that was too wet. However, the winter proved to be drier than usual and ploughing was commenced by some in June and carried on until August, when conditions became too dry to enable any further ploughing to be done. Rains during September permitted the fallows being worked with springtooth implements and harrows during that month and October, when a dry spell precluded any further workings until Christmas time, when good soaking rains were received generally. These permitted good work being done to hold the moisture, create a suitable mulch and deal effectively with any weed growth. Dry conditions prevailed during most of January and all February, and further workings were inadvisable until the afore-mentioned rains early in March.

A perusal of the following rainfall records may be of interest:—

Month.	H. Harvey, "Kindalin."	H. McFetridge, "Harefield."	Dubbo (Official)
1926—	Points.	Points.	Points.
June	......	......	138
July	75	......	104
August	88	......	162
September ...	175	......	155
October ...	30	72	56
November ...	7	......	19
December ...	520	571	565
1927—			
January... ...	120	45	89
February ...	......	......	......
March	111	27	19 to 10th
Total ...	1,146	715	1,307

The winning fallow, produced by Mr. A. L. Wright, of "Waikare,' on a medium red loam, originally a heavy pine forest, was disc ploughed in July 5 inches deep, harrowed in August, cross-harrowed early September, springtoothed early October, and crossed with same implement early November, harrowed early January, springtoothed mid-January, and cross worked early February, a total of eight workings. Sheep were also run when necessary.

The resultant fallow contained a large quantity of moisture at an even depth due to an even cloddy mulch of about 2½ inches. Consolidation was good and weed growth was kept well in hand. Altogether the result achieved was pleasing, and was close to perfection.

The results were as follows :—

Competitor.	Moisture.	Mulch.	Cleanliness.	Compactness.	Condition of headlands and finishes.	Total.
1. A. L. Wright, "Waikare" (No. 2 entry.)	32	31	32	32	9	136
2. Harold Harvey, "Kindalin" (No. 2 ,,)	33	29	34	30	9	135
3. J. L. McCallum, "Tarella" (No. 1 ,,)	33	30	33	29	9	134
4. A. L. Wright, "Waikare" (No. 1 ,,)	33	30	30	31	9	133
4. Harold Harvey, "Kindalin" (No. 1 ,,)	33	29	34	29	8	133
6. Harold Harvey, "Kindalin" (No. 3 ,,)	33	28	34	28	9	132
6. J. L. McCallum, "Tarella" (No. 2 ,,)	31	29	34	29	9	132
8. F. W. Brownlow, "Llumbaddan." ...	30	30	31	32	8	131
9. W. P. Nugent, "Terra View"	29	30	31	31	9	130
10. J. Cullen, "Redbank"	27	32	33	29	8	129
11. J. McFetridge, "Harefield"	28	29	33	27	8	125
12. G. E. MacCullagh, "Ashlee" (No. 2 entry.)	27	29	31	29	8	124
13. C. Gibson, "Oakdene"	29	28	30	29	7	123
14. G. E. MacCullagh, "Oakdene." ...	26	30	27	31	8	122
15. Cullen Bros., "Bunglegumbie." ...	28	26	30	26	8	118
16 G. E. MacCullagh, "Ashlee" (No. 1 entry.)	25	25	30	30	7	117

Mr. H. Harvey's fallow of a medium red loam of typical box and pine country was disc sundercut 2½ inches deep in July, harrowed and crossed late July-August, disced 3 inches deep late September to deal with Patterson's Curse, springtoothed early October, springtoothed late December and crossed with same implement January, harrowed early February and again early March after rain, a total of nine workings. Sheep were run continuously. The result was a nicely compacted fallow containing adequate moisture, but the mulch was too fine and shallow in places. Weeds were not present, and headlands had been well attended to. It should produce a good crop.

Mr. McCallum, of "Tarella," showed a fallow of a medium sandy loam creek frontage, partly buddah country. It was disc ploughed August and springtoothed early January. Sheep assisted largely in the production of a nicely clodded fallow containing plenty of moisture and fair consolidation, but the mulch was a bit too deep in places, affecting the compactness. Weeds were well controlled.

Some of the other fallows seen were on heavier country with a stiff clay subsoil, and although holding fair amounts of moisture, showing the desirability of early working of that particular class of country, could not be compared favourably with the above mentioned fallows.

Points on Fallowing.

As conditions must necessarily vary on different properties with different classes of soil, the owner can only find out from experience what is best suited to his local conditions and modify the general principles accordingly.

In conclusion I would stress the following points:—

1. Plough as early as possible, and to an even depth, paying particular attention to headlands and finish outs.
2. Give a deep primary cultivation, preferably with a springtooth or scarifying implement, to bring clods to the surface prior to harvest operations in the spring.
3. All subsequent cultivations to be as shallow as possible in order to create a suitable mulch, assist consolidation, and keep weed growth in check.
4. Do not work ground when dry.
5. Use sheep when necessary to assist to keep down weed growth and aid consolidation.

THE WEST WYALONG COMPETITION.

E. S. CLAYTON, H.D.A., Senior Agricultural Instructor.

Fourteen entries were inspected in the fallowing competition conducted by the West Wyalong Agricultural Society. The fallows were in very good condition—not one bad one was inspected. Most of the competitors had taken into consideration the class of soil they were dealing with, and had worked the land accordingly. Good fallows were inspected on all classes of soil from heavy black clay to light red loam.

The rainfall throughout the district was somewhat variable; towards Buddigower very little rain had been received during 1927, while at Yiddah the falls had been frequent. This variation of the rainfall was taken into consideration. Where good rains had been received full advantage had been taken of the opportunity thus afforded of working the fallows.

The awards were as follows:—

	Moisture.	Mulch.	Cleanliness.	Compactness.	Condition	Total.
H. G. Hubblewhite, "Fairfield," West Wyalong ...	33	32	34	31	10	140
C. Porter, "Clairinch," West Wyalong	33	32	33	32	9	139
D. Bolte, "Lincluden," West Wyalong	31	33	33	32	9	138
J. Gagie, "Spy Hill," West Wyalong	30	34	34	30	10	138
D. Gagie, "Spy Hill," West Wyalong	30	34	33	29	10	136
S. E Ford, "Brentwood,' Wyalong	32	29	35	29	10	135
H. S. Marshman, "Pinehurst," West Wyalong ...	33	30	33	27	10	133
H. W. Staniforth, "Buddigower," West Wyalong ...	28	32	31	30	9	130
C. Grinter, "Belmont," West Wyalong	29	29	33	30	9	130
A. M. Clements, "Fairvale," West Wyalong ...	30	31	31	28	9	129
Deegan Bros., "Iona," West Wyalong	30	26	31	32	9	128
C. H. Kalms, "Boorangagil," West Wyalong ...	30	30	31	26	9	126
P. J. Fuller, "Euline," Wyalong	33	29	31	24	9	126
C. J. Thomas, "Windera," West Wyalong	32	29	26	29	9	125

Notes on the Leading Fallows.

Mr. H. G. Hubblewhite gained first place with a well-worked fallow on heavy brown to grey self-mulching loam. The land was mouldboard ploughed in July to a depth of 4 inches, and disced in August to break up the large clods; it was springtoothed in October, scarified in January, springtoothed in February and scarified in February. All the later cultivations were shallow, and were given after rain. This fallow was in good condition, the surface was fine but crumbly and self-mulching, the consolidation was good. It was quite free from weeds and well supplied with moisture.

Mr. C. Porter's fallow was on red loam; it had been ploughed 4½ inches deep with a mouldboard plough in June, cultivated to the full ploughing depth in September, using fine points on the springtooth cultivator, and springtoothed shallow with wide points on the implement in January. The surface mulch was good, having the right degree of cloddiness. Although only 47 points of rain had been received since the end of January, the fallow was well supplied with moisture. It was quite free from weeds, and the consolidation was very satisfactory.

Mr. D. Bolte's fallow was on moderately strong reddish loam. It had been mouldboard ploughed in July to a depth of 4 inches, springtoothed deeply in August, harrowed in December after rain, and springtoothed shallowly in January. This also was a good fallow and reflected the careful working and good judgment that had been used in preparing it.

Mr. J. Gagie exhibited a fallow which was on heavy brownish red clayey loam. It had been mouldboard ploughed in July to a depth of 4 inches, then springtoothed with fine points to the full ploughing depth in October, and cultivated again in January to a depth of 2½ inches. Only 5 points of rain were received on this fallow from the end of January till judging. A very good cloddy mulch was seen on this fallow.

All the fallows entered in the competition had, of course, been heavily grazed with sheep (West Wyalong farmers are fully aware of the necessity for this) and all were exceptionally clean; in fact, this was quite a feature.

THE TULLIBIGEAL COMPETITION.

L. JUDD, H.D.A., Manager, Temora Experiment Farm.

Some very fine fallows were submitted, which were a credit to the exhibitors. It was interesting to note the universal use of sheep on the fallows; present farming practice demands the combination of sheep and wheat if maximum returns are to be procured. Besides being an exceedingly remunerative side-line, the benefits derived from their use are worthy of note. By their judicious use, cultivations for the destruction of weed growth may be materially reduced and useless weed growth is converted into manure of a valuable form, and the continual trampling of sheep over fallow materially assists in obtaining the necessary consolidation of the seed-bed.

A note of warning might be sounded against ploughing too deeply. Shallow ploughing is essential, or the waterholding capacity of the soils will be materially reduced, considerable difficulty will be experienced in obtaining consolidation, without which rather disappointing results will follow. Three to three and a half inches will be found ample for the majority of the soils in the district.

The cropping of stubble land is not to be recommended; its adoption must only be attended with disappointing, and in some cases, disastrous results. Occasionally good yields may be obtained in very favourable years, but as a general practice it has nothing to commend it.

Long summer fallowing is a system that might well find favour in the district, and I would strongly recommend its adoption. It means the ploughing or breaking up of the land as soon as possible after harvest, either with the plough, scarifier, disc cultivator, or the springtooth cultivator on certain soils and under certain conditions. On land infested with weeds this practice is invaluable, autumn rains being invariably followed by a good germination of rubbish, providing good sheep feed. The land being in a receptive condition for approximately fourteen months means the catching and conserving of the autumn and early winter rains, which are largely lost with winter fallow. In addition, more complete aeration of soil results and bacterial action is stimulated, thereby building up plant-food reserves.

Heavy stocking of the land to be summer fallowed is advisable so that all possible use can be made of stubble feed. A good burn should be procured if possible, especially if the preceeding crop has shown disease infection. Under this system no trouble is experienced in getting good consolidation, provided the cultural operations are carried out with care. From winter on to seeding, the same cultural methods are adopted as with winter fallow.

With winter fallow an endeavour should be made to carry out the initial ploughing by June if possible; under average conditions it will be found that June ploughing will pay.

The ideal mulch and condition for fallow consists of a cloddy surface of dry soil to a depth of 1½ to 2 inches in depth, overlying a level, moist and firm seed-bed, forming a union with the unploughed soil beneath, the moisture rising to the surface of the compacted seed-bed. The surface should be free from weed growth.

In working of fallow the use of the springtooth is advisable about August, going to the full depth of the ploughing. The action of this machine is to sift out the finer particles allowing same to fall to the bottom and to bring the cloddy portions to the surface. By its use the liability of air pockets and clods being in the seed-bed are remote.

Except following heavy rain, sheep may be relied upon to cope with weed growth and consolidate the seed-bed till harvest. If conditions warrant cultivation, it should be carried out with the springtooth or harrows, if the latter are used caution must be exercised not to get the mulch too fine.

The final stages of the preparation of the seed-bed are most effectively done with the Wimmera scarifier, this implement being ideal for the purpose. The use of the springtooth, except it is in good order and in capable hands, is liable to leave an undulating seed-bed. The scarifier leaves a perfectly level bed, and one in ideal condition for the reception of seed.

The first place was secured by Mr. A. Maybury, who exhibited a well-worked and carefully prepared fallow. The soil consists of a rich basaltic loam overlying a clay subsoil. The land was ploughed August-September, harrowed in October, scarified in January, and harrowed the same month. Sheep were grazed on fallow throughout.

Mr. L. Matthews secured second place with a very attractive fallow. The land consisted of a red loam. Ploughing was carried out in July; harrows were used in October, springtooth cultivator in November, and scarifier in January, followed by harrows in February.

The points awarded the leading competitors are shown in the following table :—

Name	Moisture.	Compactness.	Cleanliness	Mulch.	Condition.	Total.
A. Maybury	32	32	31	30	8	133
L. W. Matthews...	30	30	32	31	8	131
G Woodford	31	31	29	31	8	130
G. Maybury	31	30	31	30	8	130
M. McLeod	30	31	30	31	8	130
Clarke Bros.	29	29	33	30	9	130
J. H. Dale	30	30	31	30	8	129
A. Teale	31	30	30	30	8	129
L. Forrest	31	32	29	29	8	128
H. J. Hambling	31	29	30	30	8	128
H. J. Harley (No. 1 entry) ...	29	30	31	30	8	128
A. G. Brewer	29	30	30	30	8	127

Straw as Conserved Fodder.

My method of dealing with straw is to cut as soon as possible after stripping. When commencing to stack, have a cask of molasses and some coarse salt, and a spare cask or half tank for dissolving the molasses and salt in water. Have a large water-can with a rose, and well sprinkle every layer with the mixture as the stack is being built. Incidentally this will make the stack-building an easy job, as the mixture prevents the sheaves from slipping, but, more important, it provides a palatable fodder that will be readily eaten in a bad time. If the stack is well built and topped up, and a few strips of netting put over the peak and well down the roof and pegged or weighted, there will be no necessity to thatch. I have two stacks that have been up six years, and they are as good as the day they were built. Two sheaves of hay per day (three of straw or its equivalent in silage) will keep an average dry beast going.—F. H. Shepherd, at Dubbo Bureau Conference.

Some Factors for Successful Wheat-growing.

Observations made when Judging Crop and Fallowing Competitions.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.*

At the outset I would like to congratulate the Grenfell P.A. & H. Association on the excellence of their competitions, which lack nothing in enthusiasm, and are, beyond any doubt, achieving their big objective, namely, improved farming methods and increased production. District wheat growers have supported the competitions excellently, and the average quality of the blocks submitted has increased 50 per cent. in the four years during which competitions have been conducted.

I propose dealing with three aspects of wheat-growing, namely, fallowing, rotation, and disease, which the competitions referred to suggest to me as having particular significance in this district.

Fallowing is Essential.

With regard to fallowing, there is no doubt that the foundation of the wheat crop is the soil and its proper cultivation, so that at seeding time it is in an ideal physical condition to promote good germination of the grain, and induce the vigorous rooting system so essential to the successful development of a healthy, strong wheat plant. This object can be obtained by the adoption of certain principles now regarded as essential for successful wheat-growing. The ideal seed-bed for wheat is one which consists of a compacted layer of moist soil some 2½ inches deep, overlying a moist subsoil and protected by a dry layer of loose soil and small clods of approximately 2 inches in thickness. While the methods to adopt to secure this ideal condition must necessarily vary with different soils, there should be some attempt to attain standardisation in similar soils in a locality.

The first essential is to commence fallowing early so as to conserve all available moisture and to promote suitable biological conditions. The crop competitions in this district have shown distinctly that June and July fallows produce better crops than those commenced late. Of the six placed crops in the two 1926 competitions, five were first ploughed in these months.

The first cultivation after ploughing should be a thorough spring-toothing to the ploughing depth in order to bring the clods to the surface and to sift the fine soil to the bottom to form the compacted layer referred to above. Early ploughing allows this initial cultivation to take place at a more suitable time; it should at least always be done in spring before

*Paper read at the Agricultural Bureau Conference at Grenfell, March, 1927.

the advent of hot dry weather. Subsequent cultivations should be shallow and done with the object of stirring the mulch soil only, keeping it in a loose, dry condition, and weed-free. It is in these workings that wheat-growers chiefly err. Insufficient attention is given to regulating the implements to work uniformly at the correct depth, particularly approaching seeding time, and not infrequently a loose, open soil, rapidly drying out, is the result at this time. With such a condition, root growth is checked, normal growth cannot take place, and being in a weakened condition the plants are more susceptible to attack by parasitic fungi, such as take-all, footrot, &c.

Perhaps the most frequent cause of harm to the fallows is allowing weeds to grow to such a height that the disc-cultivator has to be employed and to a depth ruinous to the compacted sub-surface soil. It is essential that all weeds should be destroyed when they are very small by shallow cultivation, preferably with the harrows. Neglecting the fallow in November and December is the chief cause of dirty fallow, and there is ample evidence to show that cultivations during these months have a more beneficial effect than in any other month of the fallow period. It is evident too, that the more frequently the fallow is worked, provided it is done in the right manner, the better the chance of maximum yields. As evidence of this, the winning crop in the Central Western Championship Competition, which obtained the highest points in all competitions in the State, was cultivated ten times between ploughing and sowing. Working the soil during the hot summer months is, of course, not recommended unless rain has destroyed the mulch—in which case it should be restored.

The Implements to Use.

The best implements for working the fallow depend very much on the soil and the state of the fallow, but the ideal is to commence with the springtooth cultivator to the depth of the ploughing, and to do all subsequent cultivations with the rigid tine cultivator or the harrows. The determining factor in the choice of implement is usually the amount of weed growth. It is often possible to deal very effectively with these when very young by the use of the harrows, but should weather conditions, &c., delay the working until the weeds are too big, the rigid tine cultivator with suitable points will put the fallows into excellent condition. There is no doubt that for working the fallow the rigid tine cultivator or scarifier is the most satisfactory implement for most classes of soil. Compared with the springtooth, because it can be set to the desired depth, it does much more uniform work, makes a more even mulch, and leaves the top of the compacted sub-surface area level, not ridged. This makes for a much more uniform condition of the fallow generally, and results in a more even crop. With the correct points, or fitted with knife bars, it can deal much more effectively with weed growth, particularly thistles and melons; it has not, however, the sifting action of the springtooth, and should not displace it for the first cultivation. I wish particularly to

recommend the wider adoption of the rigid tine type of cultivator, as I have seen in fallowing and crop competitions ample evidence of their value and superiority over other implements.

The disc cultivator, regarded with such a friendly eye by most wheat growers, is without doubt the best implement of all to put the fallow in bad condition. While admitting its value in destroying large weeds, it must be admitted that their destruction when small with other implements or sheep is nearly always possible, and that large weeds are the sign of neglected fallows. Deep discing ruins the compacted sub-surface layer, and delivers the clods to the bottom and fine soil to the surface where it is easily crusted by the first rain. As discing usually takes place after harvest in January or February, not only is the whole physical condition of the fallows practically ruined, but rapid evaporation of moisture results, and there is not sufficient time to restore consolidation unless special means are devised, and they very rarely are.

The value of sheep on the fallow does not appear to be fully realised. They should undoubtedly be regarded as essential on every wheat farm; not only are they in themselves a profitable source of revenue, but they are a big factor in the production of an ideal fallow by keeping down weed growth and assisting to produce a firmed sub-surface area. It is frequently the case where sheep are run in conjunction with wheat that the latter is sacrificed for the former. This practice is to be condemned and should not be necessary if a proper rotation of crops is practised.

Adopt a Definite Rotation.

The adoption of a definite rotation system is a factor in wheat-growing which should engage the attention of growers in this and similar districts. With the somewhat haphazard methods being followed, particularly the growing of wheat continuously on stubble land, depletion of organic matter must occur, and in consequence a loss in fertility and a very harmful effect on the physical condition of the soil. The two-course rotation of wheat and fallow, while many times preferable to wheat continuously, can be improved upon by the wider adoption of a three-course rotation of (1) wheat, (2) oats, and (3) fallow, or (1) wheat, (2) pasture, and (3) fallow, which would permit of more sheep being carried, maintain the fertility and physical condition of the soil, and give greater returns. The necessity of such a rotation is becoming recognised in the older wheat districts of the State where the loss of organic matter has had a serious effect on the soil. It is necessary also for the control of wheat diseases, particularly take-all and foot-rot.

While the addition of some leguminous crop to a rotation would in all probability be the ideal system, suitable crops such as field peas could not be profitably employed. It would appear advisable to encourage by heavy applications of superphosphate to the wheat crop, the growth of the clovers and trefoil which come naturally in the wheat stubble. These provide excellent sheep feed or material for ploughing in.

In this district the most suitable rotation would seem to be (1) wheat, (2) oats, and (3) fallow. This would provide for the same area under wheat and oats, which would at first sight be considered too great. But the rotation is designed to enable considerably more sheep to be carried and the oats could be utilised as green feed, for hay or grain, or for storage as silage or grain in silos for drought periods. This rotation would assist largely in the control of take-all by virtue of the fact that oats are not susceptible to this fungus, and would assist in preventing flag smut by providing oaten chaff for horse feed rather than flag smut-infected wheaten chaff—a fruitful source of infection.

A rotation which has been under experiment in the Gulgong district for the last seven years has given very excellent results and could probably be more widely adopted. It consists of (1) fodder crop and fallow, (2) wheat. The fodder crop, for which experiments have found oats to be the most satisfactory, is sown at the end of March. This is stocked with sheep off and on from May to the end of September when the ground is ploughed and treated as an ordinary fallow, sowing with wheat eventuating the following May. Under this system excellent feed for sheep is obtained —particularly for lambing ewes or for fat lamb raising. The actual carrying capacity of the crop of oats is difficult to estimate, but last season on the 15 acres devoted to the experiment practically continuous feeding for three months for from an average of 75 to 100 sheep was provided. This included 160 lambing ewes put in on 23rd July and taken out as they lambed, and thus reduced to fifty at the end of August.

The chief benefit of a rotation to the wheat-grower is the effect on the wheat yield, and it can be definitely stated that in the district where these experiments are being conducted, the feeds from the variety trial run in conjunction with the experiment are always 50 to 60 per cent. above the average, and never yet has an area of wheat been seen in the district to equal them in appearance, freedom from disease, and prospective yield.

The average yield of wheat varieties for seven years has been 24 bushels 50 lb. With seven or eight different varieties each year, the average rainfall being 14·70 inches on the fallow and 13·70 inches on the crop, yields up to 38 bushels 40 lb. have been obtained, and in 1922, with 6·73 inches of rain only, 21 bushels were obtained with Waratah. This last season, with 11·8 inches of rain on the crop and 23·66 inches on the fallow, the plots averaged 21 bus. 7 lb. per acre, which, taking into consideration that they had the previous year carried an excellent fodder crop, and that the "finishing" rains were very light for wheat, is very satisfactory. The average of nearly 25 bushels per acre over seven years (four of which were particularly bad seasons) is probably equal to the average on bare fallow obtained in this district by the best farmers for the same period, but considerably more sheep have been carried.

The Grenfell district has approximately the same altitude as Gulgong, has a similar annual rainfall, only less erratic, and for the most part a much superior class of soil. It is suggested therefore, that some con-

sideration be given to this rotation in at least the more favoured portion of the district, because it will permit more sheep to be carried, will result in better and more disease-free crops, and materially increase the farm revenue.

Control Fungous Diseases.

Mention has been made of fungous diseases attacking wheat, and as these diseases exact such a heavy toll each year, accounting for a reduction in yield of approximately 2,000,000 bushels annually in this State alone, it is advisable that every means possible should be adopted to combat them. The problem of reducing the high loss from disease can be approached in three ways—(1) by further research work in the causation of disease and improved methods of control, and the production of disease resistant varieties; (2) by preventing the importation of diseases from other countries; and (3) by wheat growers making themselves more conversant with the various diseases and the methods for their control. With regard to the first two, every effort is being made in these directions by the Department, and it will be admitted with outstanding success. With regard to the last, the most prominent result of wheat-growing competitions is, I believe, the increase in knowledge regarding the nature and control of fungous diseases. It does not appear to be realised, however, how intimately bound up with general agricultural practice is the problem of disease control. For example, correct methods of fallowing and the production of a proper seed-bed, in which the water and air can penetrate slowly but deeply, and a sub-surface soil that is firmed to prevent a rapid spread of fungi which may be present, will tend to eliminate diseases such as flag smut, take-all, and foot-rot; the use of pure, graded seed free of internal infection will considerably check other diseases, such as flying smut, &c., and a proper rotation system will purify the soil by starving out fungous parasites.

It is suggested, therefore, that more attention could be paid to this aspect of the question, and, also, that it would pay wheat growers to observe more closely the behaviour of wheat varieties as regards disease infection. It is apparent that each variety has its own degree of disease susceptibility, chiefly associated with its physiological characteristics, which may have a very definite influence on the crops in a particular locality. The varieties under cultivation are many and increasing in number each year, a factor which I think tends towards the spread rather than the control of disease. It is thought that the number of varieties on the individual farm should be decidedly limited, and that the wholesale practice of seed exchange is not desirable and should be largely supplemented by field selection from the variety showing the most desirable characteristics on the farm.

The destructive influence of wheat diseases, therefore, could be largely escaped in any community by the majority of farmers uniting in a common effort to limit the number of varieties and improve the quality of them by selection, by becoming more familiar with the nature, causation, and control of the diseases, and by the adoption of an economical system of rotation and proved cultivation methods.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and; unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner.	Address.	Breed.	Number tested.	Expiry date of this certification.
William Thompson Masonic Schools.	Baulkham Hills ..	......	33	15 June, 1927.
Department of Education ..	Gosford Farm Homes	......	32	16 June, 1927.
H. W. Burton Bradley ..	Sherwood Farm, Moorland.	Jersey..	71	21 June, 1927.
Department of Education ...	Mittagong Farm Homes.	..	33	7 July, 1927.
Hygienic Dairy Company ..	Glenfield Farm, Casula, Liverpool.	......	113	15 Aug., 1927.
Lunacy Department ...	Morisset Mental Hospital.	....	14	18 Oct., 1927.
Department of Education ..	May Villa Homes ..	......	6	3 Nov., 1927.
Do do ..	Eastwood Home ...	.....	10	3 Nov., 1927.
Do do ...	Hurlstone Agricultural High School.	...	47	4 Nov., 1927.
Lunacy Department ..	Rydalmere Mental Hospital.	.....	61	23 Nov., 1927.
A. E. Collins...	Hazelhurst Dairy, Bowral.	..	10	6 Dec., 1927.
Miss Brennan	Arrankamp, Bowral.	.....	27	7 Dec., 1927.
Lunacy Department ..	Callan Park Mental Hospital.	......	26	15 Dec., 1927.
Department of Education ..	Yanco Agricultural High School.	...	26	12 Jan., 1928.
A. V. Chaffey	"Lilydale," Glen Innes.	......	15	25 Jan., 1928.
Lunacy Department ...	Kenmore Mental Hospital.	......	99	1 Feb., 1928.
Walaroi College	Orange	....	2	3 Feb., 1928.
Lunacy Department ...	Orange Mental Hospital.	..	3	7 Feb., 1928.
Australian Missionary College.	Cooranbong	...	51	11 Feb., 1928.

—MAX HENRY, Chief Veterinary Surgeon.

"WHEAT: THE MILLING ANGLE FROM THE GROWERS' VIEW-POINT."

THE chief attributes of Australian wheat, from a flour view-point, are marked whiteness and extremely low moisture content. Since our wheat is highly thought of, it is worth endeavouring to increase the standard of recognition that is afforded it on the basis of general quality, condition, evenness, and cleanliness. A small pamphlet entitled "Wheat: The Milling Angle from the Growers' View-point," which discusses the means by which farmers may avoid dissatisfaction between purchaser and seller and possibly reduce price dockage, has recently been issued by the Department and is available free on application to the Under-Secretary.

Green Colour in Butter.

A. A. RAMSAY, Chief Chemist, A. M. BROWN, Special Dairy Instructor, and H. H RANDELL, Assistant Bacteriologist.

DURING the early spring of 1926, a further occurrence of an abnormal greenish-grey colour, similar to that recorded in this *Gazette* in April, 1925, made itself manifest in some of the butter manufactured in two of the dairying districts of New South Wales.

Further investigations as to the cause of the phenomenon have been carried out by the Dairy, Chemist's, and Biological Branches of the Department, and the results of these investigations are summarised in the present article.

The results of the experiments conducted in connection with the previous occurrence of this condition indicated that an aphis infestation was in some way responsible for the trouble, and with a view to obtaining further data in support of this theory, as well as on the subject generally during this outbreak, a herd of cows was selected which was grazed on flat country where the pastures consisted almost entirely of trefoil (*Medicago denticulata*) infested with aphides. A number of cows in this herd were visibly affected with a skin irritation known as dermatitis. The following experiments were carried out:—

Experiment No. 1.

The milk from one of the cows known as "Magpie," a black and white animal whose skin was rather badly affected with the skin irritation mentioned above, was kept distinct from that of the remainder of the herd and was separated by itself. Half the cream obtained was neutralised to ·1 per cent. acidity and pasteurised (holding system), while the other half was left unpasteurised. Butter was made from each lot. Immediately after being made, the pasteurised butter had a very dull colour, indicative of a green tinge and after standing for two days a distinct green colour developed, which became more pronounced as time went on. The unpasteurised butter, which was churned at ·16 per cent. acidity, was a little dull in colour immediately after being made and altered very little after two days, but as time went on it developed a rather dull brick-like yellow colour with no green tinge.

Experiment No. 2.

The milk from two other animals ("Cherry" and another) whose skins appeared free from any irritation, was kept distinct from that of the remainder of the herd and was separated by itself. Half the cream obtained was neutralised to ·2 per cent. acidity and pasteurised (holding system), while the other half was left unpasteurised. Immediately after being made the pasteurised butter had a very dull colour, with a distinct inclination to

a green tinge, which, after standing for two days, developed into a pronounced green colour, becoming more definite as time went on. The unpasteurised lot, which was churned at ·34 per cent. acidity had a rather dull colour when first made, which did not alter on standing for two days, but became a rather dull yellow as time went on, with no indication of the green colour noted in the pasteurised lot. The contrast in the colours of these two butters was most marked.

Experiment No. 3.

The milk from the affected cow "Magpie," mentioned in Experiment No. 1, was kept distinct from that of the remainder of the herd, and was again separated by itself, but as there was not sufficient cream to divide into two lots as in Experiment No. 1, it was pasteurised without being neutralised and churned at ·1 per cent. acidity. The butter produced had a fairly normal colour when first made, but developed a greenish tinge as time went on.

The milk from "Cherry" (one of the apparently unaffected cows mentioned in Experiment No. 2), was separated by itself. The cream was pasteurised without being neutralised and churned at ·12 per cent. The butter produced was rather dull in colour when first made, but developed a distinct greenish tinge as time went on, the colour being more pronounced in this lot than in the butter made from the milk of the affected cows in this experiment.

Experiment No. 4.

Some of the cream from the remainder of the herd was divided into two lots, one being pasteurised without being neutralised and the other lot left unpasteurised. The pasteurised butter which was churned at ·24 per cent. acidity, had an almost normal colour immediately after manufacture, and did not alter in colour as time went on. The unpasteurised butter which was churned at ·44 per cent. acidity, had an almost normal colour, which did not alter as time went.

Experiment No. 5.

A herd of cows which grazed on both high and low lands was selected in order to obtain what might be termed "control" samples. There was comparatively little herbage on this farm. The trefoil present was not badly infested with aphides, and was mostly growing near a creek, where very little grazing was done. The flat country was mostly cultivated and was producing fine crops of lucerne, barley, and oats, none of which apparently attracts aphides. Besides being fed on these standing green fodder crops, the pastures contained barley-grass and crow-foot in fair abundance.

Cream produced on this farm was divided into two lots, one being pasteurised without being neutralised, and the other left unpasteurised. The butter made from both these lots of cream, which were churned at ·1 per cent. acidity, was absolutely normal in colour.

Results of Experiments.

The results of these experiments abundantly corroborate previous deductions that the aphis pest is intimately associated with the production of the green colour now under review, and that pasteurisation definitely accentuates the trouble. They also indicate that the production of the abnormal colour is not limited to the produce of cows suffering from the skin irritation know as dermatitis, but may be produced by any one animal and not necessarily by every individual unit in the herd.

The experiments did not indicate that the addition of bicarbonate of soda in the neutralising process has any connection with the production of the green colour.

Bacteriological Investigations.

Samples of milk from the two cows "Magpie" and "Cherry," mentioned in Experiments Nos. 1 and 2, were carefully collected into sterilised tubes during milking, and immediately taken to the temporary field laboratory for bacteriological examination.

Examinations of these samples were carried out by Breed's method and by the plate method.

The direct microscopic count showed: "Magpie" (suffering with dermatitis)—bacteria, none per c.c.; leucocytes, 1,000,000 per c.c.; "Cherry" (apparently healthy cow)—bacteria, none per c.c.; leucocytes, 20,000,000 per c.c.

The counts obtained by the plate method were low, not exceeding thirty bacteria per c.c. in either case. The flora consisted chiefly of chromogenic micrococci similar to those usually found in fresh milk.

As previously mentioned, butters made from cream separated from milk produced by each of these cows developed green colour. Bacteriological examinations of the creams which produced these butters (Experiments Nos. 1 and 2) showed counts and types of bacteria which were very similar, while the cream from the mixed milk of the herd (Experiment No. 4) was somewhat different, or at least the predominating types of organism in the mixed cream were different to those found in the cream from the two selected cows.

The examinations were repeated the following day. The analyses were:—

Cream (20 hours old), "Magpie," first lot (Experiment No. 1), total count of bacteria, 32,000,000 per c.c. Predominating types: *Micrococcus* sp., *Streptococcus lacticus*, and a non-sporing rod (orange-yellow coloured) colony.

Cream, "Magpie," second lot (Experiment No. 3), total count of bacteria, 100,000 per c.c. These included the orange-yellow coloured colony as found in Experiment No. 1, together with *Streptococcus lacticus, Zopfius* sp., *B. coli* (type), and *Micrococcus* sp.

Cream (20 hours old), "Cherry," first lot (Experiment No. 2), total count of bacteria, 38,000,000 per c.c. Plates were similar to "Magpie," first lot.

Cream, "Cherry," second lot (Experiment No. 3), total count of bacteria, 120,000 per c.c. The predominating type was the ordinary starter organism (*Streptococcus lacticus*), while there were also present other bacteria which were similar to those found in cream "Magpie," second lot.

Cream from mixed milk of herd, first lot (20 hours old), total count of bacteria, 120,000,000 per c.c. Predominating type was *B. coli* (type); the plates also showed large numbers of *Streptococcus lacticus* and an orange-yellow coloured colony.

Cream, mixed, second lot (20 hours old), total count, 80,000,000 per c.c. The predominating type was the ordinary starter organism; other bacteria present in fairly large numbers were varieties of *B. coli.*

A summary of the results of the examinations of the abovementioned six creams is as follows:—

Orange-yellow bacterium—found in five samples.
Streptococcus lacticus (starter organism) found in all samples.
Micrococcus sp. (proteolytic) found in four samples.
B. coli (types) found in two samples.

Conclusion following Bacteriological Investigation.—The results of the bacteriological examinations indicate that apparently there is no definite correlation of the bacteriological flora with development of the abnormal condition in butter under review, although further experiments are yet necessary to prove this beyond question.

Chemical Investigations.

While certain results have been obtained from the experiments already carried out, such as, for instance, the colours produced by different treatment of cream, &c., it appears that the change which actually takes place in the cream or butter to produce this abnormality, is of a highly complex nature and of chemical origin.

The following samples were forwarded to the Chief Chemist in connection with the experimental work carried out in the country:—

1. Milk and cream from cow "Magpie," affected with skin irritation known as dermatitis (mentioned in Experiment No. 1).
2. Milk and cream from cow "Cherry," apparently not affected with skin irritation (mentioned in Experiment No. 2).
3. Cream from "control" herd on crops and pasture not infested with aphis (mentioned in Experiment No. 5).
4. All experimental butters.

The result of the examination of these samples shows that the curd in the milk of the cow "Magpie," suffering from dermatitis, and of the cow "Cherry," not so affected, was white and apparently normal. The curd of the cream separated from the milk of the cow "Magpie," had a very

slight pink tinge. The curd in the cream from the control herd which did not ingest aphis was free from any pink colour. The curd in all cases was otherwise normal.

It might be suggested that the development of the pink tinge may possibly synchronise with the first proteid decomposition, but it is apparent that the condition of skin irritation (dermatitis) in the cow "Magpie," is not responsible for the pink colouration, and this supports the suggestion that the condition known as dermatitis is not responsible for the peculiar colouration in butter.

Chemical Examination of Experimental Butters.—The examination of the abnormal butters showed that in those in which the curd was dark-coloured a certain amount of proteid decomposition had taken place with the production of tyrosine and tryptophane. The presence of iron has again been established, but it is now noted that the dark colour in the curd from affected butter and from which fat had been removed by suitable solvents, became much darker on exposure to the air. In affected butters, conditions favourable or necessary for the formations of melanins were certainly present.

The investigational work carried out supports the probability of the peculiar dark colouring being of melanin origin. It cannot be stated, however, exactly at what stage the formation of the melanoid colour takes place, but apparently it has not taken place before the separation of the cream. The data, however, shows that pasteurisation helps towards the development of the peculiar colour, and that on exposure to the air the colouration of the curd is greatly increased. The butter-fat in all cases appeared to be normal.

One important point brought out by the chemical investigations is that where a herd of cows is fed on trefoil, &c., on which large numbers of aphis are present, some of the cows, possibly a large number, are unaffected, while a smaller number, perhaps one or two, as in the herd experimented with on this occasion, are affected, the milk from such cows producing butter having a peculiar colour, while the milk from the remainder of the herd produces practically normal coloured butter.

The following points have been established from the chemical investigations:—

1. Cows with no visible signs of skin irritation produce dark-coloured or abnormally coloured butter.
2. Cows with visible signs of skin irritation produce butter with a dark curd.
3. Dark curd is more common in pasteurised than in non-pasteurised samples. Pasteurisation, therefore, appears to hasten the development or production of this abnormal colour.
4. Production of butter with dark-coloured curd appears to be restricted to certain members of the herd.

5. None of the cows fed on fodder, free or practically free from aphides, produced butter with a dark curd.
6. Curd from the milk of cows which produce butter with a dark colour is quite normal.
7. Curd from cream from cows which produce butter with dark curd has a pinkish colour.

Suggestions for Minimising Trouble.

From the data obtained through the experiments carried out, a number of suggestions might be made, which, if followed, may help to minimise the trouble.

1. In the spring of the year, when the aphis pest usually manifests itself, the cows should, where possible, be kept off aphis-infested herbage and fed on silage or standing crops of lucerne, barley, oats, &c., which do not appear to be affected with the pest.
2. When the aphis infestation is at its height, pasteurisation might be dispensed with for the time being, the butter made unsalted, and methods of manufacture used which tend to reduce the curd content to an absolute minimum. Thus the use of low churning temperatures, small grain, and thorough washing are recommended.

Wheat for Sheep in Drought Time.

At the Dubbo Conference of the Agricultural Bureau, Mr. F. H. Shepherd, of Narromine, related an experience with grain feeding of sheep, as follows:—"I first tried out wheat in 1902. I made troughs of two 6 x 1 boards, nailed V-shape, and braced every few feet. I started giving wheat alone, but soon found that the stronger sheep got more than their share, so cast about to remedy that defect. Having some beeswing chaff available, I mixed about double the quantity by measure with the wheat, and I had no further trouble, as the beeswing prevented bolting. The sheep were lambing ewes, and had been dying every day. I gave them between 3 and 4 ounces per day, and they were also getting scrub. From that time the deaths ceased. I knocked all the lambs on the head as they came, most of the ewes being too weak to rear them."

The Grading of Fruit.

The operation of grading fruit has two natural aspects. Of these, the more obvious is culling, that is, the removal of the small, damaged and diseased fruits, and the more advanced is the separation of fruits into classes which are alike, within close limits, in variety, maturity, soundness, colour, size, weight, value, flavour, and freedom from blemish, or alike in a recognised combination of these qualities.—Report on Fruit Marketing in England and Wales, Ministry of Agriculture and Fisheries, England.

Why Not More Pigs?

A Plea for the Greater Development of the Pig Industry in New South Wales.

W. L. HINDMARSH, M.R.C.V.S., B.V.Sc., District Veterinary Officer (North).

WHILE other countries, notably the United States, Canada, Denmark, and Holland, have shown a great interest in the scientific breeding, rearing and feeding of pigs, this State has failed to make any great headway. The matter has frequently been referred to in the press by authorities who have pointed out that the census of pigs taken each year has shown that there is little increase in the pig population. When we consider the value of the pig to the dairy-farmer, and that pigs can be raised profitably where dairy-farming is not the staple industry, we are led to wonder why pig-farming is not more extensively carried on.

The prolificacy of the pig, its rapid growth and fattening qualities, and the variety of foods that may be used, make it one of the most profitable animals—yet the industry has stagnated. In his addresses to farmers at the conferences held at various centres on the coast last year, Dr. G. F. Finlay stated that New South Wales had ideal country and conditions for the raising of pigs, yet at times pig products have to be imported from other States.

A close examination of the replies given by farmers and others interested in pig-raising to questions on the subject, has led us to form the opinion that these reasons can all be grouped under the following headings:—

1. Lack of cheap food of the right character.
2. Insufficient knowledge of the care required in the rearing and breeding of pigs.
3. Fear of disease.
4. Breeding the wrong class of pig.
5. Uncertainty of the markets.

Let us therefore examine these points, and see if they have any foundation, and if that foundation exists, let us consider how it may be overcome.

Preliminary Consideration.

In a country such as Australia, dependent so largely on primary industries, it seems strange that lack of food of the right character should be advanced as a reason for the non-breeding of pigs. Actually, it does not appear that we cannot produce the foods, but that we do not. Pig-raising is looked upon as a side line to other branches of farming, and the raising of pigs as a commercial proposition, *per se*, has rarely been taken into consideration. In a good season when there is a flush of food and plenty of milk, the dairy-farmer stocks up his piggery, and wheat farmers with abundance of inferior grain often buy pigs as a method of turning the damaged grain to profit. Should there be a shortage of food owing to an

unexpected dry spell or something else, the farmer rushes a lot of half-fattened or store pigs to the market, his neighbours do the same, and as a result poor prices are obtained. Under such conditions it is impossible to make the best profits from pigs. Yet the farmer who is able to top off his pigs properly obtains big prices, and to him pig-raising is profitable.

Drought seasons constitute, of course, one of the problems with which the farmer in Australia has not yet learned to cope. The future of the pig industry is bound up in the regular supply of foodstuffs, and if the farmer cannot rely on having at all times an abundance of suitable foods, the industry will remain in its present haphazard condition. The Australian farmer is, however, in this happy position, that he can produce the greater part of the foods required on the farm. In Denmark, for instance, practically all the concentrates used for pigs have to be imported, and in spite of this handicap, Denmark can command the highest prices in the English markets. Hence we must first consider the foods that can be raised for pigs on the farm and elsewhere. The value of dairy products is well known and need only be lightly touched upon, but before going into detail regarding other foodstuffs, we may discuss foods generally and see what part they variously play in the growth and development of the animal body.

The Essentials of Nutrition.

Briefly, foods may be divided under the following headings:—

Carbohydrates, or foods composed mainly of starches, sugar, and fats or oils.—To this class belong the grains, root crops, fruits, and to some extent oil cakes and meals. They are used by the body to keep up the temperature, provide energy, and lay on fat. It may be pointed out that it is not necessary to feed fat and oil to animals so that they may lay on fat. The animal body is able to manufacture all the fat required from starches and sugars.

Proteins, or foods containing nitrogen.—To this class belong milk, meat, and meat by-products, leguminous plants, mill offal, and certain cakes and meals. This class of food is required for the normal growth and development of the body. It is especially required in the case of brood sows and young growing pigs. The animal body cannot manufacture protein, it must be supplied as protein in the food.

Minerals.—Certain minerals are required for the building up of the framework of the body, and for the chemical changes that occur in the nutrition and the growth of the body. Of these, lime and phosphorus are the minerals usually deficient in food. Necessary minerals are found in the legumes and growing plants, and in certain concentrates. Bonemeal will supply phosphorus and lime, while wood charcoal or ash will usually give the other minerals needed.

Vitamines.—In recent years our knowledge of nutrition has so far advanced that it has been found that there are minute quantities of certain materials in foods without which growth cannot take place and disease results. These substances have been called vitamines. Vitamines may be

found in most of the foods raised on the farm, and are especially plentiful in milk, green vegetables, lucerne, growing crops, animal fats (if not subjected to excessive heat in preparation), seeds, grains, fruits, and root crops.

Roughly in the case of growing pigs there should be four parts of carbohydrate food to one part of protein. Pigs grow so rapidly that a high protein ration is needed.

The Plea of "Insufficient Food."

With the foregoing as a basis, let us examine the foods that are available or that could be raised on the farm, and see if the contention of "insufficient food" can be maintained.

Dairy By-products.—Skim milk, butter milk, or whey can be obtained on most dairy farms. If not used for pigs or calves, there is little use for them, except in the case of casein factories, and as that industry is only in the developmental stage, it is unlikely that it will make heavy demands on the skim milk supply at present. In conjunction with other foods, milk is most valuable for pig-raising. Containing much protein and mineral matter, it is valuable for all classes of pigs—from the newly weaned sucker to the pig in the fattening pen. Generally speaking, 6 to 10 lb. of milk daily is ample for pigs. It must be borne in mind that with the removal of the fat from the milk in separating, valuable substances necessary to growth are also removed. The use of greater amounts of milk is not economical, and the feeding of milk alone is not advised. Milk should be used in conjunction with other foods, and for this purpose grains and green crops are advised.

Grains.—Practically all the grains raised in this country can be used successfully for pigs. They are mainly carbohydrate foods, and for practical purposes can be considered to give equal results. In New South Wales the grains mostly used are maize and wheat. The latter has not been sufficiently made use of in this State as a pig food, and in wheat districts there is no reason why pig-raising should not be an economical method of disposing of grain of low grade. Such foods, however, should not constitute almost the whole ration. They must be balanced with more concentrated foods that contain protein. Where milk is obtainable, it is of high value in this regard, but the deficiency may be made up with lucerne and other legumes, abattoir by-products, pollard, oilcakes, and meals. The heavy feeding of brood sows and young growing pigs on grain is not recommended.

Mill Offal.—Bran is rich in crude protein and phosphorus, but poor in lime, and as a general rule it is too bulky to be satisfactory as a pig food.

Pollard is more suitable to these animals. Like bran, it is rich in protein and phosphorus, and poor in lime. Where other foods do not supply this deficiency, it can be made up by the use of bone meal or lime. Pollard is generally made use of as an adjunct to other foods. Its nutritive value varies to some extent according to the thoroughness of the milling. Combined with milk, a little grain, and green food, it is excellent for the sow and young pigs.

Root Crops.—These include potatoes, sweet potatoes, artichokes, arrowroot, sugar beet, mangels, turnips, &c. The value of these foods depends upon their large carbohydrate content. Owing to the large amount of water they contain, they are, weight for weight, only about one-fifth the value of grain. As with the grain, it is necessary to add protein-containing foods to the ration when these crops are extensively used. In certain of our districts they could well be used for pigs. Where the climate suits, their advantages in the way of easy storage are well known. In the case of crops such as sweet potatoes, the pigs could be allowed to do their own harvesting.

Potatoes are usually boiled before feeding, although they are sometimes left for the pigs to harvest, while the larger root crops are sometimes sliced before feeding. The statements published at times that an acre of roots will fatten a certain number of pigs in a given time should be accepted with caution, since unless supplemented with other foods the pigs will not thrive.

Other Vegetable Crops.—Pumpkins and such vegetables may roughly be considered to be equal to root crops in feeding value. The seeds are rich in protein and oil, but their alleged value as a worm medicine is negligible. In certain parts of New South Wales where the milk supply is limited, good results are obtained by turning the pigs on to the paddocks to do their own harvesting of pumpkins, after the maize planted in the same paddocks has been gathered. Maize and a little milk are practically the only other foods given, and the pigs do well and bring the usual market prices.

Protein-containing Green Crops.—These include lucerne, clovers, peas, beans, and rape. Green crops such as oats, wheat, barley, and other grasses, can be included when immature and in the active growing stage, as they then are rich in protein. Later, when mature, the protein content is diminished and their main feeding value is in the seed. When little or no milk is available, these foods are of the greatest value in providing a balanced ration. Although it has been stated that pigs are not adapted for grazing, in actual practice it is found that on almost all green crops they do well, and with the addition of grain are profitable to raise. Of the crops enumerated, lucerne is the most valuable, but all the legumes and green crops are of high value.

In America, lucerne hay has been used as a pig food, and it has been stated that, provided that it does not comprise more than 10 per cent. of the ration, pigs are able to digest it. It is fed long or chopped up with the food. In New South Wales, where lucerne meal has been found of value as a poultry food, this product could also be used for pigs. It must be remembered that there is a prejudice against heavy feeding of pigs on lucerne, since the meat is said to be affected, and it is usually recommended that lucerne feeding be discontinued a month before it is intended to kill, so that the taint will be removed from the meat.

Peas, tares, &c., are excellent and have much the same value as lucerne.

Grains and other carbohydrates are necessary when pigs are largely fed on green crops, especially when they do their own harvesting. Pigs are fattened in some districts on lucerne and other grazing, together with hand-fed maize with good results.

Molasses.—This is useful in combination with other foods. It is a carbohydrate. Care should be taken in feeding as it may cause scouring in pigs not accustomed to it, and it will also taint the meat if fed in large amounts. In any case it should be discontinued during the three or four weeks prior to killing.

Abattoir By-products.—Meat, meatmeal, bonemeal, &c., are most useful as a protein supplement to the ration, and bonemeal is very necessary when the ration is deficient in lime and phosphorus. As a purchased supplement, meatmeal is one of the most valuable to the farmer. Even where the ration appears to be satisfactory, the addition of meatmeal in even small amounts will make a marked difference in the condition of the pigs. After being boiled down offal is fed to pigs in country slaughter-houses. It is usually the sole ration, and while pigs do fatten on it, better results would be obtained if grain were fed with it.

Oilcakes and meal vary according to the seed from which they are prepared and the method of manufacture. They are useful in supplying crude protein to the growing animals, and should be used when there is a deficiency of protein in the food supplied. Cottonseed meal has been used largely in the U.S.A., and with the interest latterly taken in the growing of cotton in this State it may be on the market as a local product in the future. Great care must be taken in feeding it to pigs, as it is liable to cause poisoning, but it is a valuable food.

Restaurant refuse is used in many instances for the feeding of pigs. It provides in most cases a balanced ration, but care should be taken that it is not allowed to sour or ferment. The disadvantage of this method of feeding is that foreign matters may gain access to the food through carelessness or misadventure, and loss be caused.

The foods available for pigs in this State therefore are as follows:—

GREEN CROPS.

Maize, lucerne, tares, wheat, peas, sorghum, oats, rape, grasses, barley, clovers.

ROOTS.

Potatoes, arrowroot, swedes, mangels, artichokes, sweet potatoes.

VEGETABLES.

Practically all classes.

GRAIN.

Maize, wheat, barley, peas, beans.

DAIRY BY-PRODUCTS.

Skim milk, butter milk, whey.

ABATTOIR BY-PRODUCTS.

Meatmeal, bonemeal, offal, and restaurant refuse.

MILL AND OTHER BY-PRODUCTS.

Bran, pollard, oilcakes, lucerne meal.

Plenty of Food Available.

From such a list it should be possible, by judicious selection, to have ample food of the required character through the year for the feeding and rearing of pigs. It certainly does not appear that the farmer in a suitable district can justify the statement that pigs are not raised because of insufficient food. Educational measures should be taken in various districts to show how such crops as are suitable to the district can be raised and fed to pigs at a profit. One of the great reasons why so little attention has been paid to pig-feeding is that dairy-farmers have relied almost solely on milk and maize for the purpose, and have not given the attention to other feeding stuffs that is merited.

(*To be concluded.*)

PUT A "MIXTURE" IN THE SILAGE PIT

THE bigger the mixture you can put into the pits the more it is relished by stock and the better they do on it. I have noted at shows that prizes are nearly always given to samples of silage made from clean, long-strawed crops: if I were a buyer I would give considerably more for the fine short mixed stuff. I am inclined to think that where saffron thistles are bad in a crop it would pay much better to pit than try and strip it. There is nothing obnoxious to stock in the saffron, and pitting would soften the stalks and pricks. The same applies to wild lettuce or any other of the thistles, excluding, of course, the Mexican.—F. H. SHEPHERD, at Dubbo Bureau Conference.

WHY DO THE AMERICANS GRADE WHEAT?

Firstly, they believe it to be unfair to saddle the good wheat-grower with the faults and misfortunes of the man who grows the poor stuff.

Secondly, it is a great incentive to the farmer to grow and harvest the very best quality he can if he is assured of reaping the reward of a better price.

Thirdly, they believe that the buyer wants to know as near as possible the kind of wheat he is buying, and that the confidence or lack of it that the buyer has in purchasing a parcel of wheat will very considerably affect the price he will pay.

Fourthly, their grading system enables them to establish and maintain fixed standards, the names of which indicate to all the purchasing world exactly the quality and condition of the grain sold according to the grade specified on a certificate issued and guaranteed by the Government under the Grain Act.—D. KELLY, at Dubbo Bureau Conference.

Anthracnose of Lettuce.

W. A. BIRMINGHAM, Assistant Biologist.

DURING September, 1926, Mr. A. J. Pinn, Special Agricultural Instructor, submitted to the Biological Branch for examintion certain lettuce plants from the Goulburn district for the determination of the disease attacking them. The disease proved to be anthracnose, due to the fungus *Marssonina panattoniana* (Borlese) = *M. perforans* E and E. This disease has also been known by the names of "shot-hole," "leaf perforation," "rust," and "ring-spot." This is the first known record of its occurrence in New South Wales.

Mr. C. C. Brittlebank, Biologist, Victoria, recorded it in that State in 1919. He states:

> Owing to the war conditions, lettuce seed could not be obtained from the usual source, and consequently supplies were obtained from a certain centre in the United States of America. Part of one of these consignments was sold to and planted by the owner of a market garden in a Melbourne suburb, and it was from this garden that lettuce leaves affected with the disease were obtained by Mr. Charles French, junior, Government Entomologist.
>
> There is no doubt as to the source from which the disease was brought here, as plants were raised in the garden from other seed, but only those from American seed were affected. Acting upon the advice of officers of the Department of Agriculture the diseased plants were destroyed, and up to the present no fresh outbreak of the disease has been reported. . . . The history of the entry of this disease into Australia is like that of several other plant diseases, and clearly shows the danger attached to the unrestricted importation of seed from various parts of the world where certain diseases are known to exist.

The disease has a wide distribution, having been recorded in Germany, France, Holland, Italy, England and U.S.A.

Economic Importance of Anthracnose.

The grower who submitted the specimens in New South Wales had only a few plants involved, but he stated that he knew of two growers in the Goulburn district who had lost in one case 16,000 plants and in another case 30,000 plants. This loss was attributed to the same disease, but the writer had no opportunity of confirming the statement, as all plants were said to have been destroyed.

The disease is reported as having been prevalent in Ohio in 1895, where it caused considerable loss to lettuce growers. Practically the entire acreage of this crop was lost by growers in Grand Rapids in 1898, and from 50 to 60 per cent. loss has been recorded in Germany. In Kent, England, in 1922, one grower stated: "There was no end of this trouble. I planted out 8½ acres of lettuce and they are so badly attacked that we shall have to plough them in. . . . I have this year (1922) had upwards of 20 acres that has been practically valueless owing to this trouble. Five acres of White Cos are now (February 1923) becoming infested with the disease."

Leaf of Lettuce with Lesions of *Marssonina panattoniana*.

Description of the Disease.

On the Leaf.—The fungus produces small, water-soaked spots, which enlarge, become straw-coloured to brownish, and measure up to a quarter of an inch in diameter. The spots are circular, but where the spread is restricted by the veins they are angular in shape. Ultimately the spots show dead areas in the centre, which later fall away, giving the leaves a shot-hole appearance. Diseased leaves wither quickly and the lettuce is liable to rot under storage conditions.

On the Mid-rib.—The spots, which are elongated and take an elliptical form, are to be found particularly on the underside and near the base. These brown or reddish-brown areas disturb the functions of the entire leaf.

Generally plants in infested beds show dwarfing and a yellow to brown discolouration.

Dissemination of the Disease.

The disease has occurred suddenly in greenhouses and in fields where previous outbreaks were not known, but the means of introduction is not definitely known. There is a possibility that the disease may be transmitted with the seed (and the experience of a Victorian grower suggests this), or of the existence of the fungus in a non-parasitic form in the soil.

Infection starts on the outer and proceeds to inner leaves, suggesting that the common centre of infection is diseased trash in the soil. The disease spreads to the inner leaves by local infection or by penetration of the fungus from adjacent leaves, and may spread until the whole plant is involved. Spores of the fungus are responsible for the development of the spots high up on the leaves.

During rain or the application of water by means of a hose, the spores of the fungus are dislodged from old spots and splashed on to the higher parts of the plant. It has been definitely shown that the splashing of water from plant to plant is the cause of considerable spread of the disease.

It is possible that insects also carry the spores from leaf to leaf and plant to plant. Warm, dry weather will check the trouble, but if followed by damp conditions, further development of the disease may occur.

Control Measures.

No opportunity has occurred here for ascertaining what control measures are practicable. The following are based on the experience and recommendations of authorities in other parts of the world:—

1. Practice rotation of crops—grow lettuce on the same land only once in every three years.
2. As far as practicable, destroy all lettuce refuse by burning.
3. Avoid manure containing lettuce trash.
4. Remove and burn affected plants on the first appearance of the disease.

5. Where watering is resorted to, irrigation is preferable to the use of a hose or sprinkler.

6. Avoid cultivating the plants when they are wet.

7. As a last resort, spray the plants with Bordeaux mixture* (1-1-10) or with Burgundy mixture.* The latter does not stain the plants as does the former.

LITERATURE CITED.

SELBY, A. D., Bull. 73, Ohio (U.S.A.) Agric. Expt. Station.

BRANDES, L. W., *Jour. Agr. Res.*, Vol. XIII, No. 5, 1918, pp. 261-280.

SALMON E. S. and WORMALD H., *Journal Ministry Agriculture*, Vol. XXX, No. 2, 1923, pp. 147-151.

HEDYI D., *Mon. Bull. Agr. Intell. Plant Diseases*, Yr. 6, No. 4, 1915, p. 637.

BRITTLEBANK C. C., *Jour. Agric. Victoria*, Vol. XVII, Pt. 10, 1919, p. 626.

* Leaflets on the preparation of these spray mixtures can be had free of charge on application to the Under Secretary, Department of Agriculture, Sydney.

BUSH FIRE CONTROL IN TWO WORDS—"FALLOW" AND "WATER-CARTS."

BUSH fire control in our districts can, I think, be summed up in two words—fallow and water-carts. One farm, about a mile back from the railway line, was saved twice by the one piece of fallow of 150 acres. A fire that was started by a train pulling up a steep grade in December blew straight across through a crop to this fallow, and our brigade soon beat out the sides. A short time after a fire started again from the railway line, and ran on to the other side of the fallow, and we soon extinguished the sides.

It was surprising how ignorant the majority of the people in these districts were of the effect of water on a grass fire in the early part of the season, though they had always known the value of water-carts for putting out burning logs and trees.

One of our water-carts, of 160 gallons capacity, with two loads put out 2 miles of fire which fifteen men had not been able to put out for 20 yards. The same cart with another two loads put out nearly 3 miles of fire through two crops of wheat of about 7 and 9 bags to the acre. This 160-gallon tank, when full, will put out from 1 mile to 1¼ mile of burning grass with a fine spray when accompanied by men with beaters. One 4-gallon watering-can will put out 50 yards of fire. One very disastrous fire was put out in the front by a man with a watering-can supplied by two buggies filled with benzine tins of water.—W. J. MATCHETT, at Dubbo Bureau Conference.

THE FARMER'S RESPONSIBILITY.

THE farmer also has a responsibility to discharge. He owes it to himself and the country that provides his Department of Agriculture to make full use of the facilities that are offered him. There are many who do so; on them the progress of the industry is based. Others there are who are unaware of these facilities, or who, knowing of them, are indifferent.—*Farming in South Africa.*

The California Citrus Exchange.

J. A. BALLANTYNE, Assistant Orchardist, Hawkesbury Agricultural College.

THE success of the citrus industry in California is attributed to the foresight and sound judgment of a few growers, who conceived the idea of, and organised and put into operation, a scheme of co-operation, standardisation, and distribution.

Farmers are usually most willing to co-operate when they are hard pressed, and there seems to be need of some co-operative organisation, which will help them to reduce their expenses and assist them in getting a bigger percentage of what the consumer pays for their products.

In 1894 the Californian growers were faced with bankruptcy, due to—

(1) The production exceeding the demand;

(2) Lack of control of markets;

(3) Dishonesty of dealers and agents, who were in some cases buying the fruit outright and in other cases working on a commission basis;

(4) Deterioration and decay of fruit, not only in the orchards and packing-houses, but in transit.

Although there was an immense undeveloped market for citrus fruits awaiting only intelligent and controlled distribution to make it available to the growers, owing to individualism on the part of packing-houses and growers these undeveloped markots were not exploited as they might have been. The growers or individual packing houses had no means of knowing how much fruit was being shipped to any particular market, with the result that at times the markets were glutted, while on other occasions the supply in those same markets did not equal the demand. Fruit was consigned to country markets in small lots, with the resultant high cost of transportation, &c., to the grower, and of course unduly high prices of the fruit to the consumer. In many cases the packing houses did not even know the particular wants of the buyers at certain markets to which they were consigning fruit, and consequently fruit was being packed and consigned in such a way that it was not acceptable to the buyers to whom it had been consigned.

To save the citrus industry in California from calamity some of the growers and packing house managers decided that their only salvation was a general organisation of all the citrus-growing districts in California, standardisation not only of the pack, but also of the growing and handling of the fruit in the orchards, and finally, when co-operation and standardisation had been accomplished, proper distribution of their products. With

this end in view a campaign was inaugurated, which resulted in the establishment of the California Citrus Exchange. Beginning in 1894 with 23 per cent. of the growers, and handling 805,000 75-lb. boxes of fruit, it had in 1925 75 per cent. of the producers in its organisation and handled 17,000,000 boxes.

This company has also been instrumental in forming subsidiary bodies, which have for their object the salvaging of what was formerly waste products. Annually a sum totalling £150,000 is returned to the growers by the lemon and orange products companies.

Organisation of the Exchange.

A few remarks on the different departments and operations of the Citrus Exchange in California may prove interesting. The whole exchange is, of course, under the general manager, who supervises the work of the various departments, and who is responsible for the policies of the exchange.

The California Citrus Exchange is composed of 204 packing houses, which are grouped into district exchanges; in some cases district exchanges may be composed of only three packing houses, and in others of twelve, according to the proximity of the packing houses and amount of fruit handled. A manager is in charge of each district exchange, his duties being to apportion all orders from buyers, where a special pack is not specified. He gives orders and issues instructions on all fruit being shipped from his district. The exchange managers are in close touch with conditions in their particular district, and they are able to give the sales department information regarding quality and condition of fruit being shipped by their members.

The *Sales Department* deals with the distribution of the fruit, and realises the necessity of having responsible and capable men handle the fruit at the consumers' end of the business. The California Citrus Exchange has sixty sales agents distributed over the United States and Canada. California is fortunate in having an enormous home market. These agents each week inform the Sales Department as to the number of cases of fruit they can dispose of during the coming week; likewise the district exchange manager estimates the number of packed boxes they will have for shipment the following week, and the Sales Department consigns accordingly.

The *Advertising Department* is considered one of the mainstays of the California Citrus Exchange. Where the demand for the fruit is not great, the exchange, by judicious advertising, creates a demand. In 1907 the exchange carried out a scheme of advertising to see if, by their advertising, they could increase the consumption of fruit. The results in the particular State (Iowa) where the experiment was carried out, were carefully checked over at the end of the first year, and it was found, that although the consumption of exchange fruit had increased by 17 per cent. in the whole of the United States, the consumption in Iowa, where the comprehensive advertising scheme had been carried out, had increased by over 50 per cent. The Advertising Department sends "dealer service men" around;

these men come into personal contact with the growers, fruiterers, &c. They assist the fruiterers in arranging displays and promoting sales. They also, as far as possible, get those shops to work on "a small profit on a big turnover." After having made a careful study of the question, the exchange maintains that a 25 per cent. profit should be ample for retailing the fruit.

The *Field Department*, which works in close co-operation with the Department of Agriculture, deals with the direct problems of the growers—eradication and control of diseases, soil improvement, harvesting methods, &c. In brief, the duties of the Field Department are to maintain or improve the quality of their particular "Sunkist" and "Red Ball" brands. Inspectors practically every day visit the packing houses to see that the fruit being packed is sound and up to the standard of the brand under which it is being shipped.

The *Traffic Department* advise the shippers on all their traffic problems, freight rates, embargoes, &c. They check over all consignment notes and bills. During a time of shortage in railway trucks or refrigeration space they proportion out, *pro rata*, amongst the shippers. Any claims for loss or damage to fruit in transit are made by them, assisted by the Legal Department, which represents the exchange in any suits which may arise.

The *Legal Department* advise the exchange directors regarding legislation, court decisions, &c., which affect the citrus industry. They prepare contracts and give any assistance they can to any co-operative movement.

The *Accounting Department*, like the Legal Department, came into existence as the organisation grew. It carries out investigations of prices, margin of profits, cost of production, and so on.

The *Fruit Growers' Supply Company*.—Of great advantage to the growers in California was the forming, by the exchange, of a company known as the Fruit Growers' Supply Company. This company is owned and operated by the packing houses in the exchange system. The operations of the Supply Company are to buy essential supplies for the growers and packing houses, such as implements, fertilisers, spray materials, paper, nails, &c., at greatly reduced rates. Annually they buy around 5,000 tons of tissue paper for wrapping the fruit—think of the reduction on a 5,000-ton paper order.

One of the departments of the Fruit Growers' Supply Company deserves special mention—the Bud and Seed Department—which performs a great service to the growers, through careful selection of citrus buds which are intended for use in budding nursery stock and reworking useless trees. Buds are selected from trees which have produced a high yield of good quality fruit over a period of years; accurate records are kept of each tree from which buds have been selected.

The knowledge that his trees have been worked over with buds from proven trees is of inestimable value to the grower. As California had, and as we have at the present time, a few nurserymen who are not averse to

consigning trees to growers, knowing that they are not true to name, how can we expect these same nurserymen to take any care in the selection of suitable buds?

In conclusion, a few statistics: Through co-operation of the packing houses, the cost of packing the fruit has been reduced, a saving of at least 5d. per 75-lb. box having been effected. The cost of the California Citrus Exchange, exclusive of advertising, amounts to about 3d. per box; advertising costs the growers around 2½d. for orange and 3½d. per box for lemons. Total cost of advertising, marketing the fruit, and all the services of the exchange amounts to, in the case of oranges, 5¼d. per box, and lemons 6½d. per box, which works out at 2·5 per cent. of the f.o.b. returns to the growers.

Infectious Diseases Reported in April.

The following outbreaks of the more important infectious diseases were reported during the month of April, 1927:—

Anthrax	1
Pleuro-pneumonia contagiosa	1
Piroplasmosis (tick fever)	Nil.
Blackleg	Nil.
Swine Fever	35

—Max Henry, Chief Veterinary Surgeon.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1927.

Society and Secretary.	Date.	
Wentworth (W. B. Crang)	July	13, 14
Peak Hill (T. Jackson)	,,	26, 27
Tullamore (J. M Robertson)	Aug.	3, 4
Trundle (W. A. Long)	,,	9, 10
Cootamundra (Sheep Show)	,,	10, 11
Condobolin (J. M. Cooney)	,,	16, 17
Illabo (R. Day)	,,	17
Wagga Wagga (F H. Croaker)	,,	23, 24, 25
Bogan Gate (J. Egan)	,,	24
Parkes (L S. Seaborn)	,,	30, 31
Cootamundra	,,	30, 31
Grenfell (P. Myrlebaume)	,,	30, 31
Junee (G. W. Scrivener)	,,	30, 31
Lake Cargelligo (J. B. Costello)	,,	31
Ungarie	Sept.	2
Young (T. A. Tester)	,,	6, 7, 8
Gunnedah (M C. Tweedie)	,,	6, 7, 8
Forbes (E. A. Austen)	,,	6, 7
West Wyalong	,,	13, 14
Ganmain (C. C Henderson)	Sept.	13, 14
Cowra (E. P. Todhunter)	,,	13, 14
Albury (A. G. Young)	,,	13, 14, 15
Barmedman	,,	14
Murrumburrah (W. Worner)	,,	20, 21
Canowindra	,,	20, 21
Temora (A. D. Ness)	,,	20, 21, 22
Boorowa (W Thompson)	,,	22, 23
Barellan	,,	28
Hillston (J. Peevers)	,,	30
Ardlethan	Oct.	5
Quandialla (V. Talbot)	,,	5
Narrandera (M F. Murray)	,,	11, 12
Ariah Park (M. Collings)	,,	12
Griffith (W. Sellin)	,,	18, 19
Cootamundra (Annual)	,,	25, 26
Lismore (H. Pritchard)	Nov.	16, 17, 18
Albion Park (H. R. Hobart)	Dec.	31, Jan 2

1928.

Society and Secretary.	Date.
Newcastle (E. J. Dann)	Feb. 21 to 25.
Cessnock (D. B. McGilvary)	Feb. 16, 17, 18

The State Conference of the Agricultural Bureau of New South Wales will be held at Hawkesbury Agricultural College on 26th to 29th July inclusive. Branches which have not yet nominated delegates are reminded that 30th June is the latest date on which advice should reach the Secretary to the Advisory Council.

Central Wire Bracing for Fruit-trees.

G. B. BARNETT, Assistant Orchardist, Glen Innes Experiment Farm.

MANY and varied are the methods adopted by the fruit-grower as a means of preventing the breaking of limbs of fruit-trees during years of heavy crops. The writer, whilst in California had the opportunity of seeing a plot where numerous tree-bracing methods were being tested, and the central wire brace appeared to be superior to the other methods in the plot. A test was given where fourteen men, a total weight of 2,000 lb., hung from limbs of a central braced tree, and no part of the system broke. This system was being adopted by most fruit-growers in California.

Fig. 1.—Looking down into an Apple Tree braced by the Central Wire Method. Note the wires attached to the ring by figure-of-eight knots.

The tree is braced from within by means of wires, as shown in Figure 1, each limb being supported by a wire, one end of which is attached to the inner side of the limb by means of a screw eye or staple. The other ends of the wires come together in the centre of the tree, where they are attached to a single ring at the proper height.

Method of Bracing.

A screw eye or staple is inserted on the inner side of each of the main limbs at the proper height; if placed too high on the limbs there is a tendency to pull the branches in; if placed too low, the branches are liable to break above the supporting wire. An awl is the handiest tool for

making a hole in the limb. The screw eye should be screwed into the limb until the lower side of it (the screw eye) is touching and is parallel to the limb. When using the staple it also should be left parallel, eliminating the possibility of preventing the sap flow and speeding up the callusing over of the staple or screw eye, thereby making the straining power stronger.

After the screw eye is in position, one end of a wire (No. 12 gauge) is inserted through the eye and the figure-eight tie is used to prevent slipping or pulling out from the screw eye. After tying, the wire is drawn to the centre of the tree and is cut the desired length, the same operation of wiring is repeated on the opposite limb of the tree. A harness ring (1½-inch) or metal washer is then secured to the end of the wire which has been attached to the screw eye on the first limb. With this ring or washer in one hand, the loose end of the second wire is then directed through

Fig. 2.—A Demonstration of the Strength of the System.

the ring or washer, pulled tight, and twisted securely, the figure-eight tie being used. The wires should not be pulled too tight, nor left too loose. The ring is then found to be suspended in the centre of the tree and the wires from the other limbs are then drawn up through the ring. With old trees which have long whippy limbs it is advisable to use two wires, one higher and one lower than would be used when only using one wire.

The best time of the year to brace trees is when they are in the dormant stage as the operator can see better, and there is not the possibility of destroying foliage or fruit. Screw eyes should be used on young trees as

there is the possibility of splitting limbs when using staples. For convenient work the ladder should be set up in the centre of the tree. Staples can be inserted quicker than screw eyes and should be driven in as far as possible thus allowing the wounds to heal sooner.

The method is practically permanent, and helps to give the tree an attractive shape and appearance; the strain on one limb is supported by all limbs, and the brace does not interfere with harvesting or pruning. One man should brace twenty to thirty full bearing trees per day at a cost of about 1s. per tree for material.

Material Necessary.

Ladders, hammer, pliers, staples or screw eyes of various sizes, awl, 1½-inch iron harness ring or washer, galvanised wire, preferably No. 12 or 15.

The Fundamentals of Insurance.

The subject of insurance is one that cannot be decided on a £ s. d. basis. The whole basis and substance of the scheme is composed of the elements of uncertainty. If you are strong enough to carry the risk the probability is that you will be well repaid for doing so. If on the other hand the loss will have a crippling effect on your business or enterprise, as the case may be, cheerfully join the great army who find it convenient to pay an insurance company to take the risk, even though it cuts deeply into your profits; certain good is better than uncertain hope.

The fact that one has paid premium for a number of years and had no claim is no criticism; in another period of the same duration many losses may occur and of such magnitude as to have dire and overwhelming effect. To what extent the measure of protection afforded should be availed of must be determined by seasonal and climatic conditions, as 1916 and 1926 amply demonstrated—except in the case of buildings.—G. Tanswell, at Dubbo Bureau Conference.

Rabbit Destruction.

There is perhaps no animal at large with the faculty of self-preservation more pronounced than the rabbit. There certainly is not any animal with more natural enemies, and without cover it is impossible for it to protect itself. It is a prey to hunting animals and birds, but given a little cover and respite it soon entrenches itself and becomes a menace not only to the spot it infests, but to surrounding country.

"Aim at the rabbit and you miss him; aim at his cover and you hit him," is a very true saying. Put the rabbit on the surface without harbour and the problem of extermination is solved. Rabbit extermination should be regarded in the same light as other farm improvements, and there are very few, if any, improvements which will show such a substantial return on outlay.

A pamphlet detailing the methods found to be most effective for the destruction of rabbits is available to farmers and graziers on application to the Under-Secretary, Department of Agriculture, Sydney.

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Wheat—

Bena	W. Ash, Old Grenfell Road, Forbes. J. W. Wilson, Collie Road, Gilgandra.
Binya	Manager, Experiment Farm, Condobolin.
Canberra	Manager, Experiment Farm, Trangie. W. W. Watson, Woodbine, Tichborne. Quirk and Everett, Narrawa, Wellington. T. Jones, Birdwood, Forbes. Manager, Experiment Farm, Condobolin.
Clarendon	Manager, Experiment Farm, Coonamble.
Currawa	W. Cameron, Heather Brae, Loomberah. Quirk and Everett, Narrawa, Wellington.
Federation	W. W. Watson, Woodbine, Tichborne. T. Jones, Birdwood, Forbes. D. L. Miller, Glen Lossie, Daroobalgie.
Firbank	Manager, Experiment Farm, Condobolin. Manager, Experiment Farm, Trangie.
Florence	T. R. Jones, "Birdwood," Forbes.
Gresley...	W. W. Watson, Woodbine, Tichborne. Manager, Experiment Farm, Condobolin. T. R. Jones, "Birdwood," Forbes.
Hard Federation	Manager, Experiment Farm, Trangie.
Turvey	D. Bolte, West Wyalong.
Wandilla	G. R. B. Williams, Gerelgambeth Ltd., Illabo. T. R. Jones, "Birdwood," Forbes.
Waratah	Manager, Experiment Farm, Trangie. W. W. Watson, Woodbine, Tichborne. G. R. B. Williams, Gerelgambeth Ltd., Illabo. J. W. Wilson, Collie Road, Gilgandra.
Yandilla King...	D. L. Miller, Glen Lossie, Daroobalgie. T. R. Jones, "Birdwood," Forbes.

Oats—

Gidgee	Manager, Experiment Farm, Trangie.
Mulga	Manager, Experiment Farm, Condobolin.

Field Peas—

French Grey	Principal, H.A. College, Richmond.
Lima	Principal, H.A. College, Richmond.

PURE SEED—*continued.*

Potatoes—	
Satisfaction	**Hillen and Leckie, "Cherragorang." Taralga.**
	J. J. Maloney, jun., Stonequarry-road, Taralga.
	Parsons Bros., Dangarsleigh, Armidale.
Early Manistee	**J. Cusack, Stonequarry-road, Taralga.**
Factor	**R. E. Ball, Stonequarry-road, Taralga.**
	K. Bowen, Spring ide, via Orange.
	Howard Bros., Cottawalla, Crookwell.
Carmen No. 1...	**Johns Bros., "Strathalbyn," Myrtleville.**
Batlow Redsnooth	**T. A. Howard, Cottawalla, Crookwell.**
	E. M. Herring, "Sheen," Batlow.
Tomato Seed—	
Bonny Best	**Manager, Experiment Farm, Bathurst.**
Chalk's Early Jewel	**Manager, Experiment Farm, Bathurst.**

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

THE EVIL EFFECTS OF WEEDS.

WEEDS, like all other plants, absorb moisture from the ground. In badly-infested lands the water taken from the soil may represent several inches of rainfall which would have remained in the soil for the use of the crop at a critical period.

Remember :—

Weeds cut down your yield.
Weeds damage your crop.
Weeds cheapen your product.
Weeds reduce your profit.
Weeds rob the soil.
Weeds injure your stock.
Weeds reduce the value of your farm.

THE METHODS OF TOONGI BUSH FIRE BRIGADE.

WHEN a fire appears, the first thing a member does is to ascertain the distance it is from his holding. In flat country, or if the fire is on the other side of hills, it is sometimes difficult to say how far it is away—it may be 4 or 40 miles distant. A method of range-finding frequently adopted is to get a compass reading of the direction of a fire from a friend 6 or 7 miles away by telephone, and, knowing the direction and distance of the friend's home, it is a simple matter to draw a plan with a base of, say, an inch to the mile, which when the laterals are measured will give the exact distance the fire is away.

When we have located a fire we hasten to the spot nearest to us, and to the back, if possible, and begin to extinguish the fire from there. Members whose land lies in front of the advancing flames take up their stand on a road, creek, or prepared fire-break, or endeavour to burn back from wet sprayed grass. If not too windy, burning back can be effected from a screen of sheet iron, such as a couple of sheets of corrugated iron on the ground and pulled by a piece of wire. The burning back fire is usually ignited by burning grass drawn by a rake or a cage of wire-netting containing burning sticks, or by a special kerosene torch.—W. J. MATCHETT, at Dubbo Bureau Conference.

Poultry Notes.

JUNE.

JAMES HADLINGTON, Poultry Expert.

The Economic Position of the Poultry Industry.*

IT has become an accepted idea that by exporting our surplus eggs we have stabilised the local market at a much higher level than obtained before systematic export was undertaken by the present pool.

In order to get the facts in this connection I have made an analysis of the financial position obtaining in the poultry industry over two periods, commencing with 1914.

Taking the three years 1914, 1915, and 1916, the average price received for eggs was 1s. 3d. per dozen, and the cost of feeding averaged 6s. 8½d. per hen. On a basis of 12 dozen eggs per hen, this gives a return over cost of feeding of 8s. 3½d. per hen.

We now take the three years 1924, 1925, and 1926. The average price of eggs over that period was a trifle over 1s. 6½d. per dozen. This shows an increase in the price of eggs of 20 per cent. Our cost of feeding over the same period was a fraction over 9s. 11¼d. an increase of 33 per cent., which leaves the poultry-farmer 13·33 per cent. worse off than in the period 1914 to 1916. Nothing more is needed to show that the price of eggs has not by any means kept pace with the cost of feeding, let alone with the increased cost of living which has been taken into account in every other industry.

This shows that the poultry industry would be in a bad way indeed if there were no compensating factor enabling the farmer to increase his earning power. Fortunately for the industry that power has been increased to a marked extent. I refer to an increase in production. For the period 1914, 1915, and 1916 our competition average was 183 eggs per hen, while for the period 1924, 1925, and 1926 the average was 204·66 per hen, or an increase of 12 per cent. If the production has increased in the same ratio on the farm, and I believe it has, the production for the two periods on a twelve-dozen basis would work out at an increased return of about 1s. 6d. per hen. As a matter of fact, had production not increased, the poultry industry must have become absolutely defunct as far as commercial operations are concerned.

If asked how this increase has been brought about, I should say, first, by better methods, and, second, by better breeding.

In order to deal with the present position we may go back to the Bathurst Conference, where my figures were accepted on the question of cost of production. It was there shown that on a commercial basis, and a most

* Notes of an address at Miranda on 16th May, 1927.

conservative estimate, it was necessary to obtain an average price for eggs for the year of 1s. 9d. per dozen in order to cover cost of production. I have since shown that to obtain such an average, our minimum local price must not recede below 1s. 6d. per dozen. This conclusion has since received fairly general endorsement by commercial poultry-farmers, and the only complaint is that the 1s. 9d. average price is not sufficiently high to cover a large proportion of the conditions under which eggs are produced. This objection can only be met by stating that no estimate of cost of production would be sound unless it was based upon what is possible commercially. In this respect we cannot afford to have our accepted cost of production challenged on ground of over-estimate. It is therefore, I think, necessary to accept the verdict, and then to consider ways and means whereby the 1s. 6d. minimum can be attained.

Unless we have an effective organisation that will compel, either by moral suasion or by other methods, a greater percentage of poultry-farmers to contribute to a pool, some other scheme must be evolved for meeting possible loss on export. At Blacktown recently I gave figures which showed that, by allowing the local price of eggs this year to fall to a possible safe London parity (or at any rate what would be regarded as such) the poultry industry would, after meeting the possible loss on the number of eggs actually exported, be the poorer by £51,500.

The question is: Why should this large sum of money be lost to poultry-farmers; or, in other words, why let an estimate of London parity rule over local prices when that parity is below the cost of production?

It might be asked, why anticipate that this would be the case. Since export has become a special feature in the last few years, losses on export have been followed by low prices during the next season of flush production.

Connect up these facts and the conclusion is obvious. We have all been under the impression that export has stabilised our local price, but it will be agreed that if it is to be stabilised any lower most poultry-farmers will soon be out of the business.

The point is, if the industry is to be maintained on a profitable basis it is necessary that the price be kept up to last year's figure of 1s. 6d. as a minimum for first-grade eggs. How is it to be maintained? The answer is, not by acknowledging a supposed London parity, or by 60 per cent. of poultry-farmers carrying the burden of all the loss on export, but by increasing that number of farmers sufficiently to ensure more effective organisation, and by some arrangement that makes export to carry its own loss, leaving the local price to be stabilised at what will give a fair return to the producer.

There is, as far as I can see, only one way by which this £51,500 can be saved to the industry, and that is by a mutual undertaking on the part of poultry-farmers to accept an advance on the proportion of eggs actually exported, the balance, if any, to be returned to the producers on realisation. It appears to me that it will pay the poultry-farmer better to lose as much

as 4d. per dozen on even 40 per cent. of his first-grade eggs exported, than to let the local price fall to 1s. 4d. less the 1d. levy, which has been the case in the past, and which, I fear, is the alternative to some change of system this year.

The two propositions will work out thus:—An estimated export of, say, 50,000 cases, or 1,500,000 dozens at an advance of 1s. 2d., would return to the pool £87,500. The other 50 per cent. of the eggs marketed during the export season, being sold at 1s. 6d. per dozen, would return £112,500, which would make a total of £200,000.

For the purpose of comparison, let us take the position based on the 1s. 4d., less 1d. levy, on 1,500,000 dozen. This works out at £93,750. Add another £93,750 for local sales at the same price, and we get £187,500—a loss of £12,500 on the eggs handled by the pool during the export season only. To this must be added the 1d. levy over the remainder of the year, which, estimated at another 2,660,600 dozen, would amount to £11,110. The total loss on the present system as compared with the system of 1s. 2d. advance would thus be £23,610. Every penny realised over the advance of 1s. 2d. per dozen would mean an additional £6,250.

That is the position as affecting those supporting a pool, but it is not the whole position, because the total estimated number of eggs affected by the local price, over and above those exported, is approximately 8,500,000 dozen. Under the present system the export of 1,500,000 dozen may be said to govern the price of 10,000,000 dozen.

If these figures stand for anything, they show conclusively that, in principle, the advance on export, with proper safeguards and regular balancing of accounts, duly certified, is far and away the best for everybody. There is sufficient solidity amongst poultry-farmers to make this system a success. The penny levy has proved a sufficient temptation for many to evade its operation by selling their eggs through other sources than the pool, and thus to get the benefit of the higher prices brought about by the self-sacrifice of those contributing to the pool. How much greater will be the inducement to evade the loss of 4d. to 6d. on the proportion of eggs that would be their quota towards export? This is the "nigger in the pile," and I venture to say that unless there is brought into being an all-embracing association of poultry-farmers the first season's export will break down the system, and the last state will be worse than the first.

MARKETING CULLS DOES NOT PAY.

ON fruit which is sent to market unculled, the grower loses at every stage. He pays packing costs and carriage on the culls, and, not only does he get little or nothing for them, but they actively depreciate the value of the rest of the package in the eyes of possible purchasers.—Report on Fruit Marketing in England and Wales, Ministry of Agriculture and Fisheries, England.

Orchard Notes.

JUNE.

W. J. ALLEN and H. BROADFOOT.

Pruning.

THE pruning of deciduous trees should be commenced as soon as possible, as it is always advisable to keep well ahead with various orchard operations. Unavoidable delays sometimes arise, and to forestall these the orchardist should endeavour to have something "up his sleeve." Preparatory to pruning it is advisable to put in order all the tools required. Secateurs should have a keen edge and should be properly adjusted; otherwise much time is wasted and a good clean cut (any other is detrimental to the tree) is impossible. The pruning saw should be properly set and sharpened: work with a dull saw not only prolongs the time spent on the job, but the work is not so well done.

In order to facilitate pruning operations a good ladder is essential. It should be light, strong, and serviceable, with sufficient spread to enable it to stand steadily whilst the pruner is at work. The heavy, clumsy, unsteady type of ladder sometimes used by growers was commented upon in a previous issue; such a ladder retards operations, which should be expedited by every means within the orchardist's control.

In the pruning of young trees the great aim should be the development of a good framework with well-spaced limbs. This not only conduces to the health of the tree and the favourable development and colouring of fruit, but it also facilitates picking, spraying, and cultural operations, and, in addition, enables the tree the better to carry its load with less danger of bent or broken limbs. For the first few years of the life of a tree, leaders should be cut well back. Besides observing the foregoing general rule, it is necessary for the pruner to study the requirements of each tree, for each has its own individuality, which the pruner, to be successful, cannot ignore. Some trees will be found to be making rapid growth, whilst others grow slowly; some have an upright and others a spreading habit; some will be weak on one side and strong on another; some will be found almost limbless on one side and much overcrowded limbs on the other. The pruner should not work impetuously; he should first envisage the tree as a whole, form a mental picture of the ideal tree which he wishes it to become, and, with judicious care, prune accordingly.

In the pruning of older trees the characteristics of the various classes and varieties must be taken into consideration. Peaches, for instance, crop only on the previous year's growth, and the older wood, unlike that of the apple and pear, will not retain a permanent self-replacing spur. With older apple and pear trees it is sometimes necessary to thin out fruit bearing spurs, which otherwise become too crowded. So many factors influence the

development of a tree—soil, location, vitality, and the general treatment the tree receives—that each must receive individual treatment for the result to be the production of good fruit.

Ploughing.

Many growers suffer because of delay in carrying out this important work. Ploughing is allowed to stand in abeyance until spring, when, at times, a dry spell sets in, and the work cannot be done effectively; moisture is allowed to escape, and the soil is not put in a condition to absorb the rain. Thus with insufficient absorption on the one hand, and too great depletion of moisture due to excessive capillarity on the other, trees are adversely affected. The detrimental effects of deficient soil moisture are evident in several directions—retarded tree growth, retarded fruit development, and sometimes serious crop failure for the following season. It is impossible to grow good trees that will carry good regular crops unless cultivation is well attended to. Risks from neglected cultivation are so serious that they should not be taken. Cultivation should be carried out promptly, regularly, and thoroughly; delay, neglect, and slumming lead inevitably to loss.

Planting.

This work should be completed as soon as possible, as it must be borne in mind that root development begins long before that of the leaves and branches, and the energy exerted by the young plant is wasted if the tree is not transplanted before such root development takes place.

Trees arriving from the nursery should be most carefully inspected, and those rejected which are poorly developed or diseased. It is to be feared that many growers are not careful enough in this respect. The trees to be planted should possess a good fibrous root system, a good union between the stock and scion, and a good healthy top growth. They should be placed in a trench and the roots covered with fine, moist soil, from which they can be removed for planting when required. Planting should not take place during wet weather or when dry winds are blowing; it is a good plan to dip the roots in a puddle hole as the tree is removed from the trench. The tree should be planted at the same depth as it grew in the nursery.

Diseases and Pests.

When pruning this winter, the removal and destruction by fire of all twigs infected by powdery mildew is strongly recommended, as this will greatly assist in keeping this disease in check. Spraying the trees later with colloidal, atomised, or atomic sulphur, is recommended.

A strict watch should be kept for San Jose scale and the trees sprayed with oil. Apple trees badly infested with woolly aphis should receive a spraying of tobacco wash—a good pressure is necessary when spraying to dislodge aphides. Bandages for codling moth should be left on the trees as grubs are inclined to leave less protected places as the weather becomes colder and seek the shelter afforded by the bandage. Grubs can be destroyed by dipping the bandages in boiling water some time before spring.

Agricultural Gazette of New South Wales.

A Rice-growing Competition.

MURRUMBIDGEE IRRIGATION AREA (YANCO CENTRE).

THE JUDGE'S REPORT.

W. R. WATKINS, H.D.A., Agricultural Instructor.

RICE was sown for the first time, commercially, on the Murrumbidgee Irrigation Area in 1924, when 143 acres were cropped. The results obtained were so promising that the next season saw 2,211 acres under this crop, and the land and climatic conditions being suitable the crops made excellent growth, causing a great deal of interest to be centred on them. The fact that rice-growing might prove a profitable industry was soon realised.

During the 1925-26 season the Yanco Irrigation Area Agricultural Society arranged to conduct a rice crop-growing competition, the conditions and allotment of points being as follows:—

1. Area to be 5 acres.
2. To be one variety in one block.
3. Plot to be pegged out by the competitor before judging takes place.
4. Judging to be carried out at a time to be arranged by the committee. Competitors to be notified at least three clear days before judging.
5. A sample sheaf to be exhibited by each competitor at the Leeton annual show, for which a maximum of ten points will be awarded.
6. Competitor to state at the time of entry the following particulars:— (*a*) Variety; (*b*) quantity of seed per acre; (*c*) time of sowing; (*d*) treatment of land for twelve months prior to sowing; (*e*) amount of fertiliser per acre, if any.
7. Judging to be carried out according to a scale of points as set out hereunder:—
   (*a*) Preparation of land, including seed-bed, facilities for irrigation, control of water, and drainage facilities—50 points.
   (*b*) Freedom from weeds. First crop 24 points, second crop 26 points.
   (*c*) Condition, appearance and evenness of crop—25 points.
   (*d*) Apparent yield. One point for each bushel of apparent yield.

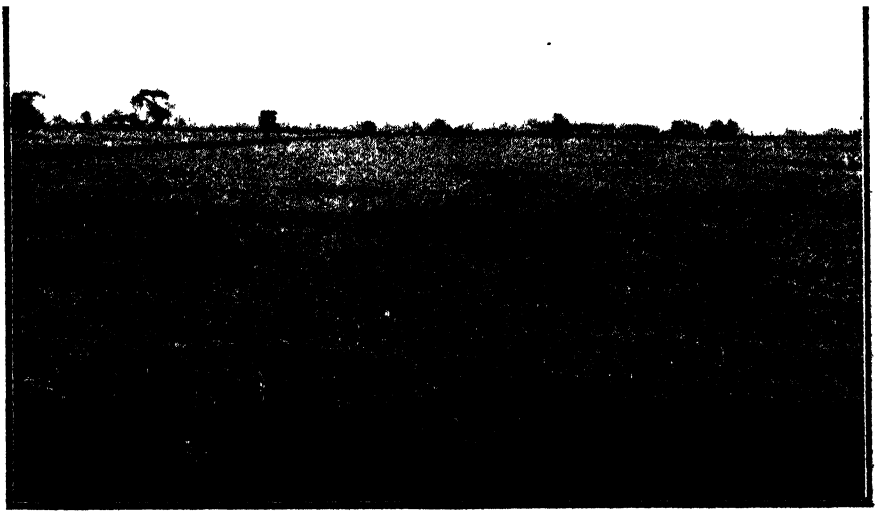
With the exception of one or two, the crops made a great show during the season, and the competition brought forth ten entries. The first prize was won by Miss L. Grant, with an excellent crop of Colusa, which had been grown for the first time from seed obtained from America. Mr. H. L. Tooth secured second prize with a splendid crop of Caloro, grown from seed originally obtained from America in 1922. The competition caused a great deal of interest, a party of growers and intending growers accompanying the judge in his tour.

The 1926-27 season saw a big increase in the area under rice, there being approximately 5,700 acres sown, and although the conditions during the growing period were perhaps not quite as favourable as the previous year, the crops made good growth. During this season the Society received a

handsome silver cup, donated by the Australian Rice Millers' Association, to be competed for annually and held by the winner for one year. The Society then arranged to give the winner of each competition a small replica of the championship cup, besides cash prizes, as a permanent token of the success.

This season thirteen crops were entered in the competition, but owing to some of the competitors being over anxious to harvest their crop, only seven were judged, which was done during April.

The crops were exceptionally good, save for being a little backward in maturing, and promised high yields. Although the growth made this season was not as tall as in the previous year, the plants stooled well and seemed to head out better. The coolness of the summer prolonged the maturity of the crops, and these conditions continuing into the early autumn



Mr. H. L. Tooth's Rice Crop.
The winning block of 5 acres was included in this area.

prevented the grains from hardening up and also had a tendency to cause an uneven ripening of the grain. Colusa, the early-maturing variety, showed out the best as far as condition was concerned, carried a harder grain, and seemed to ripen more evenly. A softness of the grain of Caloro can be understood, as that variety has a higher moisture content than either Colusa or Wataribune. An uneven depth of water during the period of submergence will cause an uneven ripening of the grain, and wherever the land is uneven it should be levelled, especially gilgai country. More attention should be paid to the facilities for irrigating, the control of the water, and the drainage of the land, as these are very important factors in the production of high yields and mainly depend on the preparation of the land, sound and high check banks, and clean and well-made ditches.

The manner in which this crop grows, and the yields obtained, show its suitability to the soil and climatic conditions of the area. However, the same conditions are also very favourable to tremendous weed growth in the form of cumbungee, water or barnyard grass, slender or wild aster, rushes, and reeds, and these will render the land practically useless in a very short period, not only for rice but for other crops as well, if thorough methods for their control are not adopted in the early stages of rice-growing.

Over-cropping of the land, with a lack of good working, will soon cripple the rice-growing industry. The growing of this crop calls for more and better "nursing" of the land than for any other crop under cultivation in New South Wales, and the best returns will be obtained over a lengthy period if areas are only planted that can be properly handled and the land cropped no more than once every three years. A rotation with winter cereals for fodder crops should be carried out.

RESULTS of Competition.

	Preparation of land, facilities for irrigation, control of water, drainage facilities.	Freedom from weeds.	Condition, appearance, evenness.	Apparent yield.	Variety.	Total.
Maximum points	50	24–26	25	180	......	Approx. 280
	Points.	Points.	Points.	Points.		Points.
H. L. Tooth ...	46	21	20	165	Caloro ...	252
W. Hunt	43	20	22	165	Colusa ..	250
G. H. Blencowe I. .	43	20	20	160	Caloro ...	243
G. H. Blencowe II.	43	20	19	155	Caloro ...	237
W. Hill	41	21	22	150	Colusa ...	234
G. Watson	43	20	18	135	Caloro ...	216
Le Green and Darchy	42	22	18	120	Wataribune	202

The Leading Crops.

The winning crop was grown on virgin red loam soil that had been disc-ploughed in August to a depth of 3½ inches, springtooth cultivated in September, then harrowed. The seed was drilled in on 7th October at the rate of 90 lb. per acre, and sown at a depth of about 2½ inches. The first watering was given the same day, and the soil was not allowed to dry out on the surface until just before the period of submergence commenced and when the plants were about 6 inches high, when a drying of the soil was allowed until the plants showed a yellowish tipping; then the land was submerged. This drying and tipping at this period tends to make the plants stool better, but care and attention is needed if it is adopted. Much credit is due to Mr. Tooth for the crop produced, as it was the result of thorough work and careful attention from the preparation of the land. The methods and devices adopted on this farm for irrigating, controlling the water, and draining are almost perfect. An even depth of 6 to 8 inches of water was

maintained over the land throughout the period of submergence from when the plants were sufficiently high, resulting in a good yielding crop being obtained. The crop stood about 3 feet high, was very even, had headed out well, but was a little backward as to condition, resulting in a little uneven ripening of the grain. There were no weeds showing, as this settler, realising the importance of clean land, had hand-weeded the 60 odd acres under crop; this entailed very little labour, as the land was new and only an odd plant of water grass showed through.

The second prize went to a crop of Colusa grown by Mr. W. Hunt on heavy gilgai country. The land had been previously cropped to barley, was sundercut early in October, and drilled in at the end of the same month, 100 lb. of seed per acre being used. The first watering was given immediately after sowing, the second during the first week of November, and in the second week of the same month the land was submerged. When the plants were sufficiently high an even depth of 6 to 8 inches of water was maintained over the land. The crop was a heavy yielding one, about 3 feet high but a little uneven, due to gilgais. The grain had ripened evenly, was large and on well-headed plants, and had hardened up well. A few weeds were present, and two trees in the block spoilt the condition and appearance of part of the crop.

The majority of the crops on the area this season were clean, especially those sown on new land, and have returned some very high yields.

Fallowing and Sheep.

Fallowing can only give the best results when combined with sheep, and it actually provides the opportunity for keeping sheep. When fallowing is not practised the straw is burnt off and the land is ploughed for the succeeding crop; but under a fallow system it is not necessary to burn the straw, for the stubble can be grazed with sheep six or seven months after harvest. A great deal of the straw is eaten, and the balance is broken and trampled into the ground, and it is generally put in such a state that it can be ploughed under easily without the texture of the land being interfered with.—A. H. E. McDonald, at the R.A.S. Animal Husbandry Conference.

"Soil Ventilation" and the Nitrogen Supply.

The maintenance of satisfactory chemical changes and normal bacterial changes in a soil, is dependent upon its proper aeration, and the full significance of soil ventilation, as it might be called, is now being recognised. The pore spaces in the soil between the different particles require to be replenished from time to time with supplies of oxygen, and the excess of carbon dioxide must make its escape. Unless this is provided for, biological activity necessary for breaking down the organic matter, is retarded, and valuable nitrogen may be set free as gas and lost to the soil.—F. A. Stockdale in the *Tropical Agriculturist.*

Fallowing Competitions, 1926-27.

MORE JUDGES' REPORTS.

CENTRAL-WESTERN DISTRICT.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

THREE years ago the Eugowra P. & A. Association was the only society in the Central-western District conducting a fallow competition. This season practically all the societies in the wheat-growing portion of the district conducted competitions either as combined fallow and crop or for fallow alone.

Competitions were judged during March and April as follows:—

	Entries
Grenfell P. A. & H. Association	41
Cowra P. A. & H. Association	12
Eugowra P. & A. Association	6
Young P. & A. Association	24
Molong P. & A. Association	4
Cranbury Agricultural Bureau...	8
Total	95

The first four were combined fallow and crop competitions.

The season was an excellent one for determining the condition of the fallows. The winter months were wet and ploughing was not commenced, in the majority of cases, until August and September. October and November were very dry and the first substantial falls on the fallows were towards the end of December. January rains were good but February was very dry. In the first week in March just prior to the commencement of judging, from 60 to 100 points of rain fell.

Rainfall registrations representative of each centre were as follows:—

Month.	Grenfell.	Eugowra.	Cowra.	Young.	Cranbury. (Canowindra)	Molong.
1926.	Points.	Points.	Points.	Points.	Points.	Points.
June	249	210	189	206	146	250
July	200	172	177	146	223	220
August	117	114	169	181	175	180
September ...	157	184	276	286	135	214
October	92	57	96	118	133	98
November ...	20	77	47	55	28	64
December ...	286	214	324	302	422	430
1927.						
January	406	200	380	560	238	320
February ...	10	50	8	29	Nil.	48
March	75	133	145	64	116	121
April	...	...	...	...	50	...
	1,612	1,411	1,811	1,947	1,666	1,945

The following points were awarded to the winning fallow in each competition :—

Association.	Competitor placed First.	Moisture.	Mulch.	Cleanliness.	Compactness.	Condition.	Total.
Cowra ...	F. C. Rowlands & Sons, Waugoola.	33	33	34	31	10	141
Grenfell ...	F. Adams, Greenethorpe ...	33	31	33	31½	9½	138
Young ...	O. G. Blayney, Grenfell ...	32	31	34½	30½	10	138
Eugowra ...	W. J. Bradford, Eulimore ...	32	32	35	30½	9½	139
Molong ...	Mrs. J. Berney, Cumnock ...	28	32	34	30	9	133
Cranbury ...	S. Nash, Canowindra	31	33	33	30½	9½	137

How the Winning Fallows were Worked.

F. C. Rowlands & Sons (Cowra).—After a good burn in January, 1926, the ground was disc cultivated. A heavy growth of trefoil took place during the winter and early spring, and this was fed off heavily, and a thick coating ploughed in with the mouldboard early in September, followed by harrowing. The fallow was springtoothed in December and January and harrowed after the early March rain. Sheep were kept on continuously, and were mainly responsible for excellent compactness of the sub-surface. This was in every way an exceptionally good fallow.

F. Adams (Grenfell).—Mouldboard ploughed in June 4½ inches deep, harrowed end of August; springtoothed September-October deeply; recrossed with springtooth January and February shallow depth, and harrowed early in March. A very well worked fallow containing excellent moisture and consolidation, clean and nicely mulched.

O. G. Blayney (Young).—In April the ground was disc cultivated, followed by a mouldboard ploughing 4½ inches deep in September; combined early in January and cross-combined in February. An exceptionally clean fallow correctly worked as regards depth, very well compacted, containing a lot of moisture and nicely mulched.

W. J. Bradford (Eugowra).—Mouldboard ploughed 4 to 5 inches deep in September, disced October, springtoothed January, harrowed February and combined March. Sheep were on the fallow continuously. A perfectly clean fallow containing good moisture, very well mulched and compacted.

Mrs. J. Berney (Molong).—Mouldboard ploughed early September 4 to 5 inches deep, springtoothed December, harrowed January and early February, rigid tyned and harrowed middle of March. A very clean, nicely mulched fallow, fairly well consolidated and containing fair moisture.

S. Nash (Cranbury).—Mouldboard ploughed end of August, harrowed October, springtoothed end of December, harrowed January, combined mid-March. Sheep were on the fallow all the time. Advantage was taken of every decent fall of rain, and correct working produced a very nicely mulched fallow, with good moisture content, well compacted except for surface unevenness, and good finishes.

A General Analysis.

Moisture.—Ample moisture was present generally in the subsoil, but the surface soil varied considerably from practically dry to very moist, depending to a certain extent on the time of ploughing, but largely on the after cultivation. Where advantage was taken of the excellent rains in December, January and early March to work the soil to the right depth, the moisture content was remarkable. The fallow containing the most moisture for the lightest rainfall was one in the Young competition at Yannawah. It was commenced in June with the mouldboard, and to mid-March had had eleven cultivations employing the disc cultivator, harrows, combine and culti-packer. From June to mid-March 8·45 inches of rain had fallen, and the effect of frequent cultivations on moisture content was strongly evidenced.

As the weather conditions have remained practically dry since judging the benefit of correct working and conserving moisture is now being felt, as growers can go on with their sowing without the fear of a bad germination.

Mulch.—The necessity of restoring the mulch after rain to prevent evaporation is fairly generally realised. The degree of fineness of the mulch is a debatable question. The heavy rains of last season at seeding time and the consequent battering down of the fallow led farmers to err on the rough side this season. The fine mulch has undoubtedly been the most effective this season from the point of view of moisture storing. The surface of the mulch is, however, chiefly a matter of the nature of the soil.

The depth of the mulch should be considered more seriously, and is dependent on the class of implement used and the depth to which it is operated.

Cleanliness.—The fallows were generally very free of weed growth, the most prevalent weeds being stink (commonly called black or summer) grass (*Eragrostis major*). This is the worst weed on the fallow in the Central-west and is widely distributed. It has a most pronounced effect on the soil moisture and a most injurious effect on the succeeding wheat crop. It is very early maturing and when young, an excellent sheep feed. It can be controlled by cultivation when very young or very heavy stocking with sheep before it has seeded. Couch grass in sandy country appeared to be particularly bad this season.

Unfortunately the fallow is often sacrificed for sheep and weed growth allowed to take place to provide summer feed. This should not be necessary if the farm is not overstocked and judicious use is made of the stubble and grass lands.

Compactness.—The most frequent fault with fallows is neglect in not compacting the sub-surface soil. The necessity for doing so is not realised by the majority of wheat growers. Where fallow competitions have been held for some years the most noticeable improvement is in this respect. It is, however, far too common to see a fallow in March which has been one-wayed or springtoothed to a depth of 4½ to 5 inches.

As a general rule one deep springtoothing after the initial ploughing is the only deep cultivation necessary, successive cultivations being gradually shallower to no more than stirring the mulch from 2 to 2½ inches deep between January and seeding time. The deep cultivation immediately prior to sowing is particularly objectionable mainly because it is responsible for seed being sown at too great a depth from the surface.

To secure the much desired level surface to the compacted area the use of rigid tyned implements is recommended.

Headlands and Finishes.—The chief fault in this connection is in too deeply cultivating diagonals and finishes. This results in a deep, dusty mulch and a lack of consolidation.

RIVERINA DISTRICT.

G. C. BARTLETT, H.D.A., Agricultural Instructor.

The Class of Competition.

Wagga.—The Murrumbidgee P. and A. Society again conducted a comprehensive combined fallow and crop competition, taking in the whole of the fallow on the farm, for the district extending from Illabo to The Rock. To this society belongs the honour of being the first to conduct crop competitions in this State, and the benefits derived are quite easily apparent in the class of fallow and crop seen to-day. The Wagga district produced the best class of fallow, on the average, in those districts visited and judged by the writer. This year there were fourteen entries, which were judged on 1st March.

The Rock Farmers and Settlers' Association, this year for the first time, conducted a combined fallow and crop competition, and some very fine fallows were seen. The competition was on comprehensive lines, taking in the whole of the fallow on the farm, similar to the Wagga competition. There were fourteen entries which were judged on 7th March.

Corowa P. and A. Society again conducted a combined fallow and crop competition for 50-acre blocks. This society originated its competition in this manner, and has adhered to this policy with excellent results. There is always a large number of entries, and post entries for the crop are not allowed. The interest shown in this competition in this district is most marked, and the improvements achieved are most noteworthy. Some three or four years ago, when the competitions first commenced, hardly any fallows were worked decently until just prior to seeding. To-day the fallows compare favourably with almost anywhere. Last year, although they were judged after heavy rain and the moisture content was consequently high, the leading fallows scored from 110 to 114 points. This year, after a dry spell, and with the moisture content much lower, the winners ranged from 124 to 132 points, and some of these were the same competitors as last year. This year there were twenty-seven entries judged on 15th March.

Finley P. and A. Society has conducted two or three crop competitions before with excellent results, and this last season the winner in this district also won the Royal Agricultural Society's champion cup for the Riverina. This year, for the first time, the competition is combined fallow and crop, and confined to 50-acre blocks. The fallows were judged very late in the season, and as the weather had still remained fine, they were much drier than those judged the month before. A cup was offered only a fortnight before judging, and the society immediately decided to accept it and organised the competition with such good results that thirty-two entries were judged. This also speaks well for the interest of the farmers.

The Season.

The season over the whole of this portion of the State was rather a dry one, and for this reason it has been an excellent one for judging the fallows, correct workings showing up to advantage. The only summer rains to speak of occurred in January, and these were quickly followed by warm and dry conditions again. It was the fallows that the farmers managed to work quickly to take advantage of these rains, that were successful.

On account of the comparative dryness of the summer, the majority of the fallows could not be worked to advantage much after harvest, but the season showed up those fallows that had been correctly worked before they dried out.

There was very little weed growth on the fallows, as a whole, except a few paddymelons. There had not been enough rain over the season to obtain a good strike of weeds, and farmers were rather anxiously awaiting some good falls before sowing on this account.

The Soils.

The soils in the Wagga district are mostly good red loams—some are a little on the light side. They are timbered with a good mixture, mostly pine and box. Those of The Rock vary considerably, and it was difficult to find one paddock of even texture. On the undulating parts good red loams are generally found, which quickly run to heavy red clay bands on the flats, or else heavy white chalky areas. Sometimes a mixture of all three was seen. The timber is rather mixed, with little uniformity about it.

Corowa soils vary considerably, but the paddocks are more uniform than those of The Rock. They consist of red loams, heavy red clay loams, heavy black and red loams with self-mulching patches. Taken on the whole, they are mostly on the heavy side and timbered with yellow box and bull oak. One or two of the paddocks seen were crab-holey and of a distinctly self-mulching character, and one or two were very light and sandy. These latter were generally found on belts of pine ridges.

The soils of Finley are mostly of a heavy red clay loam nature, rather shallow and timbered with yellow box and bull oak. One or two sandy loam belts occur where pine is found, and one or two areas are of a heavy self-mulching character.

Cultural Methods.

Many farmers still think that the more workings a fallow receives, irrespective of the weather, the better. But this is not the case. The vital points are early ploughing and correct workings before harvest. Fallowing correctly done not only conserves moisture, but increases fertility, and makes a suitable, firm, moist seed-bed for the young seedlings to obtain a firm foothold. This is particularly important, as it lays a foundation upon which to sow; it ensures a quick, even germination, and gives the seedlings a good start. Fallowing also helps largely in disease control.

It has often been said that in some seasons, especially wet ones, the best fallows do not produce the best crops, and some farmers have been in a quandary as to what to do. The last season was quoted by many as one in case. The methods recommended for fallowing are laid down as a guide for the average season, and the most successful farmer is the one who caters for this. However, a record of the cultivations given the various fallows last season was kept, and in Corowa, Coolamon, Lockhart, Narrandera, and Oaklands districts the first four crops in each case were grown on the best fallows. Some of these fallows had had four, five, six, and even as many as seven workings, after ploughing and before sowing.

The outstanding feature of the competition this year was the success of early ploughing, mostly June-July, followed by a harrowing next month to break the top down, and a good deep rooting through with either the springtooth or the rigid tine scarifier either in September or October. This had the effect of bringing the clods up to the top and laying the foundation for a fine, firm seed-bed. Most of the fallows had two or three workings later to break down the clods and form a suitable mulch.

Those fallows that had been ploughed late and had not received this treatment were in very faulty condition. The seed-bed was hard and dry and full of large clods and air pockets. Underneath these clods the rubbish and stubble had not decomposed.

In many cases the disc had been used late in the season to break down the clods and cut out weeds, and each time with a very detrimental effect on the fallows. Taking the first three placed fallows in the whole of the four districts judged, it was found that not one of them had had a disc implement on them after ploughing.

The rigid tine scarifier is an implement that has come very much into prominence in the Riverina during the last two years, and it is doing excellent work. It is displacing the springtooth in many cases, but on the average red friable loam the springtooth is the best implement to work the soil deeply in September to bring the lumps to the surface. The scarifier is an excellent implement with which to perform the summer cultivations; it cuts out the weeds better than the springtooth and also makes a more even depth of mulch and a good level seed-bed. Excellent work of this kind was done at Wagga with knife bars attached to the scarifier, but the country must be free from roots and stumps. On the

heavier soils that it is difficult to get the springtooth into satisfactorily, it was found that the rigid tine was doing better work. The scarifier with wide points is an excellent implement with which to work the summer mulch on this type of country. It is also the most suitable implement for working the more sandy loams. These soils break down very easily and are inclined to cake. The best results are obtained on these soils by the use of the scarifier in conjunction with sheep. These soils cannot be cultivated as frequently as the heavier loams, and the sheep and scarifier keep down the weeds more efficiently with less working, while both assist in obtaining consolidation. The scarifier did not break down the mulch to the same extent as the springtooth, but left it in nice ridges which prevented a good deal of crusting.

The scarifier should also do excellent work on the heavy, self-mulching, and crab-holey patches of country in parts of the Finley district and of Coreen near Corowa. This country is very similar to Wimmera country, and the smoodger and scarifier should be used frequently to break the patches up and even up the paddocks. The self-mulching patches, if ploughed deeply, crack and crumble up and dry out right into the subsoil, and a suitable seedbed cannot then be formed. At present this class of country is not being worked correctly, but if handled in the right manner it could be brought to a great state of fertility and produce big crops—those produced now in certain seasons are evidence of this.

Most of the soils of Corowa and Finley districts are heavy, and the spike roller and smoodger are doing good work in breaking the clods down. These clods dry very quickly and get very hard, and the chief fault noticed in local practice seems to be that the farmers leave the breaking down until too late in the season. Many farmers were breaking their clods down and working their country up in order for seeding only at the time of judging or just prior to that. The season had been dry for some time and the fallows were mostly dry right into the subsoil. In many cases it was necessary to go down over 6 inches before any signs of moisture were found. Dry working frequently results in bad infections of foot-rot and take-all in the ensuing crop. If possible the lumps should be broken down and the mulch formed before the clods dry out in the spring. Less work with the scarifier was being carried out in Finley district than in almost any other district visited, and it is a district with a type of soil that the scarifier should particularly suit. The soil is heavy and rather shallow, and if the clods are broken down with the smoodger or spike roller in the spring and the soil is worked with wide points on the scarifier over the summer, some excellent results should follow.

Ploughing is usually rather shallow in this district—2½ to 3 inches deep—causing a hard pan to form about 3 inches down. Certainly the soils are rather shallow, but in most cases the subsoil is about 6 inches down and farmers are advised to plough 4 or 4½ inches where possible. If this can be done without touching the subsoil it will break the hard pan up, increase fertility and assist better working of the fallows later on and the

formation of a deeper seed-bed. Most of the seed-beds were very shallow, and very dry and hard, mostly only about 1 inch in depth. Many of the clods could be brought up from the seed-bed almost as they had been turned under by the plough with the grass and stubble still undecomposed on the underneath side. It is thought that deeper and earlier ploughing, breaking the clods down in the spring and forming a good mulch with the scarifier should improve the fallows greatly in this district.

Summer fallowing is now being practised in many parts, and this showed up well in the competitions at Wagga and Finley.

Details of the Leading Fallows.

The following are the details of the three placed blocks in the four competitions.

Murrumbidgee (Wagga).—The competition was won by Mr. T. Fraser. The best block of four submitted was of red loam and was summer fallowed. It was scarified in February 4 inches deep, mouldboard ploughed in June 4 inches deep and let lie for three months. It was then harrowed twice (in September) and scarified deeply with the narrow points in October; harrowed twice in November, scarified 2 inches deep with the knife bars attached in February, and harrowed twice. This was easily the best block seen in the whole of the four competitions judged. At the time of judging it would be very difficult to improve on its condition.

Mr. J. R. T. King was second. His soil is red sandy loam; the best block of two entered, was mouldboard ploughed in July 4½ inches deep and harrowed in August, scarified in October, and harrowed in January.

Two entries tied for third place. On the farm of Mr. A. Alleyn, the best block of four submitted, was summer fallowed, and was the second best block seen in the Wagga competition. The soil was red loam, scarified in February 3 inches deep, mouldboard ploughed in July 4½ inches deep, harrowed twice in September, springtoothed deeply in October, harrowed in January. Although this block only received one cultivation from October till judging time, it showed the important part played by summer fallowing and good working prior to harvest.

AWARDS in Comprehensive (Whole Farm) Fallow Competitions.

Society.	Competitor.	Moisture.	Mulch.	Cleanliness.	Compactness.	Condition.	Total for best block.	Farm Average.
Murrumbidgee (Wagga)	T. Fraser	32	33	34	32	10	141	136½
,, ,, ..	J. R. T. King	30	31	32	30	9	132	132
,, ,, ..	A. Alleyn	32	29	32	33	9	135	130
,, ,,	Gerilgambeth Ltd. ...	31	31	32	31	9	134	130
The Rock	W. G. Michael	31	32	34	29	9	135	135
,, ...	G. Johnston	31	31	33	30	8	133	133
,, ...	Geo. Magrath	32	32	34	32	8	138	132

Gerilgambeth Ltd. shared the third place. On the best block of two judged the soil was red loam. This was mouldboard ploughed in July, scarified in August and again in October, and harrowed also in October, scarified in February.

The important part played by the scarifier in this competition will be readily seen.

The Rock.—First place was won by Mr. W. G. Michael. The soil varied from red loam to heavy chalky flat with gravel rise in the top portion of the paddock, which rather marred one-half of the entry, but showed that with careful handling one may win a fallow competition even with patchy soil; the best block of two, was mouldboard ploughed 4½ inches in June, harrowed in September, springtoothed in October deeply with the narrow points and shallow springtoothed in January.

Mr. G. Johnson was second. His soil is light loam with a clay band across the middle. One block was judged and this was mouldboard ploughed 4½ inches deep in the beginning of August, harrowed twice in October and springtoothed in February. The majority of this paddock was of a light texture and difficult to handle, and it was heavily stocked with sheep which did good work in keeping down weeds and assisting consolidation.

The fallows awarded third place were entered by Mr. George Magrath. The soil is light red loam, difficult to handle to prevent powdering: the best block of two, was mouldboard ploughed in July, cross-harrowed in September, scarified in mid-October and again in February. Sheep were used to good purpose.

Corowa.—Mr. A. McDonald won this competition with a fallow of red loam, which had been mouldboard ploughed in July, harrowed in October and scarified in November and February, the first time deeply, the second time to a shallow depth. The seed-bed was a little faulty, but the mulch was very good.

Second place was won by Mr. J. T. Clifton. Soil red light loam to sandy loam; the fallow was mouldboard ploughed July, scarified in October, and harrowed in January.

Mr. F. W. Knight was third with a fallow of red light loam to sandy loam, which had been mouldboard ploughed July, harrowed in October, and then springtoothed.

These two entries showed that it is not always advisable to work light soils frequently.

Finley.—This competition was won by Mr. W. Waite. The soil is a red loam; the fallow was mouldboard ploughed 4½ inches in July, harrowed twice in August, springtoothed deeply with narrow points in September, harrowed in November, harrowed and combined in February. The mulch was a little fine, but there was an excellent seed-bed and the moisture content was one of the best in the district.

AWARDS in 50-acre Fallow Competitions.

Society.	Competitor.	Moisture.	Mulch.	Cleanliness.	Compactness.	Condition.	Total.
Corowa ...	A. McDonald ...	28	32	32	31	9	132
" ...	J. T. Clifton	29	31	30	31	8	129
" ...	F. W. Knight ...	29	30	29	30	9	127
Finley ...	W. Waite	21	31	31	32	10	125
" ...	T. Sleeman	17	32	33	32	9	123
" ...	J. Tullock	18	32	30	30	9	119

Mr. T. Sleeman won second place. The soil is heavy red loam, rather shallow. The fallow was mouldboard ploughed in August, harrowed in August after ploughing, scarified in September, harrowed in October. It was not touched till it was spike-rolled in March and scarified in April. There was an excellent mulch present at the time of judging, and a very level seed-bed, but the latter was rather dry and hard. Probably it was not ploughed quite deep enough, and the spike-rolling to break down large clods should have been done before it dried out.

Third place was filled by Mr. J. Tullock. This block, of heavy red loam, was summer fallowed, being disced up 3½ to 4 inches deep in March. It was disc-ploughed in August and harrowed, and in September it was smoodged, spike-rolled and harrowed. In October it was springtoothed and harrowed, and it was harrowed again in January. This block had a good mulch and fair moisture, but the seed-bed was rather uneven and a little bumpy. It had been well broken down in the spring before it dried out, but probably the cultivation in October was not deep enough.

"ALFALFA-GROWING IN THE UNITED STATES AND CANADA."

LUCERNE (or, as it is called in many countries, alfalfa) is a crop of such varied utility and great adaptability that the books discussing it would almost form a considerable library. Americans have been particularly generous contributors to the literature on the subject, and here is another. The author is Professor George Stewart, of the staff of the Utah Agricultural Experiment Station and College, and he has had the help and criticism of quite a list of men conspicuous in agricultural research and teaching institutions in North America.

Necessarily the book is written from the point of view of local conditions, but many of the problems discussed are common to the crop in this and other lands. The principal exception seems to be variety, for whereas only one variety with minor differences, the result of local environment, is grown all over Australia, in North America, Peruvian, Common, and Grimm, with other variegated strains, each have regions to which they are best adapted and where the others are rarely seen.

Lucerne is one of the factors that is reducing the speculative element in primary production, and the attention devoted to it is therefore likely rather to increase than decrease. The present work of over 500 pages will contribute to the profit with which the crop can be handled.—Our copy from the publishers: The Macmillan Company, New York.

The Treatment of Liver Fluke in Sheep.

H. R. SEDDON, D.V.Sc., Director of Veterinary Research.

THAT sheep which are infested in the liver with the common leaf-like parasite known as the liver fluke may be treated successfully, has been demonstrated by previous work at Glenfield Veterinary Research Station (see *Agricultural Gazette,* January, 1926). This treatment, using standardised extract of male fern, has, however, the drawback that it is somewhat expensive, costing as it does about 6¾d. per sheep. In the case of limited numbers of animals this might be borne with equanimity, but where large numbers require to be treated the cost is undoubtedly high though by no means prohibitive.

Recently further attention has been given to the matter in England, and a drug (previously used almost solely in the treatment of hook-worm in man) was found to be of value in the treatment of liver fluke. A supply was therefore obtained and tested.

At the Veterinary Research Station tests were first made to ascertain the safety of the drug, and it was found that up to eight times the usual dose could be administered to sheep without their showing signs of poisoning. Certainly the placing of such large quantities in the mouth causes slight distress for the moment on account of the volatility of the drug, but the sheep invariably recover after a few minutes rest. Being satisfied as to the absolute harmlessness of the drug when given in the proper medicinal doses, the next step was to devise a suitable method of administration. The drug in question, carbon tetrachloride, is of an oily nature, and water is therefore an unsuitable vehicle. In England and Ireland it had been administered in soft gelatin capsules, but there is some objection to these owing, firstly, to their expense and, secondly, to the fact that some special instrument and a certain dexterity are required in passing the capsules down the throat of a sheep. After some trials it was decided to dilute the drug with liquid paraffin, and this has been quite satisfactory in at once providing a suitable material for dilution and (on account of its oily nature) in protecting the sensitive mucous membrane of the mouth from the drug which otherwise is somewhat irritant.

The first opportunity of testing the drug on fluke-infested sheep occurred when the writer was on a visit to a property in the Monaro district. A number of mixed sheep, all more or less fluke-infested, were placed at my disposal. Eight were treated with the drug in capsule form and seven with the drug dissolved in liquid paraffin. Eleven days later, five of the first lot, and all seven of the second lot were killed by Mr. Stock Inspector Blomfield, but no flukes, alive or dead, were found in any of these sheep though they showed lesions caused by flukes. Four out of five similar sheep which had been killed prior to drenching showed the presence of living flukes, though in none of these could the infestation be said to be severe.

A supply of the drug was left with this owner, who was so impressed with the results described above that he wished to try the drug on any really badly-affected animals he might find. He treated over eighty sheep, and of these later killed two, neither of which showed any flukes. Two others, treated after dipping, were badly affected and he expected them to die. One died twelve and the other about twenty-four hours after dosing. They were examined almost immediately, but all the flukes were found to be dead. Of seventy-seven others, he states that "after a week all showed marked improvement," and of a few aged ewes showing "bottle jaw" he writes that in the same time the "bottle" had improved. So satisfied was this owner that he asked for 1,300 doses to treat other sheep.

Whilst the tests recorded above appeared to be highly satisfactory it was desired to see the treatment tried out on a number of badly fluke-infested sheep in another locality, and fortunately just at this time, Mr. H. G. Belschner, B.V.Sc., District Veterinary Officer, Orange, had a badly-affected flock brought under his notice. Arrangements were therefore made for a confirmatory test to be applied there. Two points in particular were further tested, namely, the effect of double doses, and of previous starvation. Prior to treatment an aged ewe was picked at random, slaughtered, and examined for liver flukes. Over 200 were found, and the following sheep were therefore treated:—

Ten ewes, starved overnight and drenched at 10.30 a.m. next morning. Seven of these received 1 cc. of carbon tetrachloride (in liquid paraffin) and the remaining three a double dose. Ten ewes, taken direct from the paddock, were treated the same morning. Of these, seven received 1 cc. and three 2 cc. of carbon tetrachloride (in liquid paraffin).

Eleven days later Mr. Belschner again visited the property, and conducted a post-mortem examination upon several of the animals in order to check the efficacy of the treatment employed. He noted that the treated sheep had improved in condition, although there was hardly time from the date of dosage for that to be very marked.

The following table gives the result of these examinations:—

Ewes starved overnight.			Ewes unstarved, taken direct from paddock.			Ewes untreated.	
Sheep No.	Dose.	Flukes found	Sheep No.	Dose.	Flukes found.	Sheep No.	Flukes found.
1	1 cc	None.	5	1 cc	None.	9	Heavy fluke infestation.
2	1 cc	None.	6	1 cc	None.		
3	2 cc	4 (alive)	7	2 cc	None.	10	"
4	2 cc	1 (dead)	8	2 cc	None.	11	"

It should be noted that all those treated showed severe changes in the liver as the result of recent infestation by numerous flukes. These results thus confirmed those obtained previously, and further, gave proof that starving the sheep before treatment is not necessary.

Conclusion.

As a result of our experience with carbon tetrachloride, using three distinct samples of the drug, we can conclude—

1. That it is highly efficacious, leading to rapid destruction of the flukes, which, even in a few days, are expelled from the liver.

2. That a dose of 1 cc. is sufficient, even for grown sheep.

3. That preparation of the sheep by previous starvation is not necessary; they may be taken direct from the paddock and drenched.

4. That it may be administered either in capsules or as a drench.

5. That it is quite as efficacious as standardised extract of male fern, easier to prepare and administer, and, as will be seen below, less costly.

Cost of the Treatment.

The drug in suitable form is put up by a city firm at a price of less than one penny per capsule. These require some special form of balling gun or long forceps for administration.

If the mixture of carbon tetrachloride and liquid paraffin is used the treatment will be found to be still cheaper, and at present wholesale prices costs about one-third of a penny per dose. To administer this a syringe of 5 cc. capacity is necessary.

Recommendation.

In view of the undoubted efficacy of the drug, that only one dose is necessary and that its cost is so low, owners of fluke-infested sheep are recommended to use either —

1. Carbon tetrachloride capsules, dose 1 capsule (1 cc.), or

2. A mixture of carbon tetrachloride, 1 part; liquid paraffin, 4 parts: dose, 5 cubic centimetres (5 cc.) given by the mouth by means of an ordinary hypodermic syringe (minus the needle).

Reminder.

Owners are reminded that while the dose recommended above will remove practically all the flukes then present, animals are not rendered immune, but will again become infested; it is necessary, therefore, to drench sheep from time to time.

While it is not known definitely at what time of the year sheep become invaded by the young flukes, such is believed to take place in the late summer and autumn. Owners of badly fluke-infested properties are therefore urged to dose their sheep about early or mid-autumn, and again in the early winter months. Local experience of the effects of liver fluke should be a useful guide. The aim should be to dose sheep *before* they show obvious signs of the disease. By so doing the consequent loss of condition is prevented.

The Department would be very glad if owners will communicate to it the results obtained by the use of carbon tetrachloride.

Lamb Raising.

Hawkesbury Agricultural College, Season 1926.

A. K. CANTRILL, Sheep and Wool Instructor.

THE comeback ewe flock of 200 was mated in April and May, 1926, with 3 per cent. of Romney Marsh rams. Lambing took place in September and October, 71 per cent. of lambs being marked. The lambing percentage would have been appreciably higher but for a number of lambs being killed by dogs prior to marking.

Conditions throughout were good except for a dry spell in November, which resulted in a slight check in the growth of the lambs and made them somewhat dry in appearance. During the year the flock was grazed on natural pasture, a fodder crop of oats and rape, and lucerne.

Throughout the year the ewes were regularly drenched at monthly intervals for worms, and at no time was any bad effect apparent in the pregnant ewes, the wet ewes, or the lambs. The lambs were drenched after they were 2 months old without any ill effects.

A draft of fifty wether lambs was sold on 24th March, 1927—forty-five at 18s. 4d., five at 17s. 10d., average price, 18s. 3½d.

Data as to loss of weight in transit was obtained during marketing. Four of the lambs were weighed at the College prior to despatch and again after their arrival at Flemington; the weights were as follow:—

Weight at H.A. College.	Weight at Flemington.	Loss during Transit.	Average Loss.
lb.	lb.	lb.	lb.
78	72	6	4·5
77	73	4	
77	74	3	
73	68	5	

The lambs sold were the picked fifty from the wether portion of the drop. The remaining wethers were retained at the College for ration purposes, and the whole of the ewe portion for breeding purposes.

Correction.

IN a report entitled "Cabbage and Cauliflower Trials on the Hunter," which appeared in the *Agricultural Gazette*, May issue, the quantity of P. 3 fertiliser mixture is erroneously stated in the table on page 375. The figure 77 lb. should have read 717 lb.

Black Root-rot of Tobacco in New South Wales.

Thielavia basicola (B. and Br.) Zopf.

L. F. MANDELSON, B.Sc. Agr., Assistant Biologist.*

The yield of tobacco varies considerably in New South Wales from year to year. The figures for the five-year period ending June, 1924, show that the average annual yield was 14,344 cwt. In 1924 the yield was 9,325 cwt., for the following year 4,567 cwt., and for 1926 it was approximately 14,000 cwt. The Tobacco Expert of the Department estimates that the yield for the present season will be about 3,000 cwt., which is considerably below the average.

At the commencement of this season growers experienced some difficulty in growing sufficient seedlings for their requirements. It is reported that the ravages of insects were partly responsible for this. It was noted later that those which were planted out had ceased growing actively in the Tamworth district early in December, and on the whole the same thing was observed throughout the State about Christmas time. On 3rd February, Dr. G. P. Darnell-Smith inspected the tobacco crop at Bathurst Experiment Farm, and described the plants as having "ceased to grow; they are flowering prematurely, the stems are hard and woody, and the terminal roots in most cases dead. Here and there an odd plant is growing to normal size."

The crop at Bathurst did not recover and was stunted when harvested. At Tamworth, on the other hand, the recovery was complete and some good yields were obtained. At Tumut there was only a partial recovery.

The weather conditions for the season were unusual. Temperatures were abnormally low, and it has been suggested that this was the chief contributory factor concerned with the stunting of the crops.

An examination of affected plants from several localities has shown a root-rot condition, with which was associated the fungus *Thielavia basicola* (B. and Br.) Zopf, the organism responsible for black root-rot of tobacco. This is the first record of the occurrence of *Thielavia basicola* in this State, and apparently also in Australia.

It is the purpose of this article to briefly describe the relationship of the fungus to the disease and to emphasise the effect of weather conditions upon the development of black root-rot.

Symptoms of the Disease.

The disease is a root-rot, and the causal fungus only affects the root system and the stem below the surface of the soil. The root system is darker than normal and is usually black in parts. In slightly affected plants

* The writer wishes to express his thanks to Dr. R. J. Noble, Principal Assistant Biologist, for helpful advice and criticism in reference to this work.

the fibrous roots are more or less rotted away (as was generally the case with root systems examined this year), but in severe cases the roots may be more distinctly rotted, often only a blackened residue of a root being left. The natural result of this depletion of the root system and of the diseased condition of the remaining roots is that the plant does not get sufficient food and water, and so becomes stunted. This is most noticeable during the heat of the day, when affected plants may wilt. The leaves usually have a yellowish appearance, and the plants tend to bud prematurely. A characteristic of this disease is that there is a very uneven growth throughout the crop, an extremely stunted plant often being found alongside one of normal height. This is more marked than with any similar effect caused by unfavourable soil or weather conditions.

The disease is also found in the seed-beds, where it rots the roots of the seedlings. Affected seedlings show little vigour and may wilt and die.

The Causal Organism and its Hosts.

Thielavia basicola has been known for many years in Europe and America. It was first reported by Berkeley and Broome (1) in 1850 in England, and was completely described twenty-six years later by Zopf (11) in Germany. As a parasite on tobacco it was reported for the first time by Peglion (8) in Italy in 1897, and two years later Selby (9) found it on tobacco in the United States.

The black root-rot disease of tobacco which is caused by this fungus has been described by Johnson (3) in the United States as "one of the most widespread diseases of tobacco, and undoubtedly has caused more losses to tobacco-growers as a whole than any other disease with which they have to contend."

Further he reports (4) that besides tobacco it attacks other plants, about a hundred species in all, *e.g.*, peanuts, beans, peas, red clover, alsike clover, lucerne, cotton, watermelon, &c. Most of these plants are not affected as severely as tobacco, but their presence on the land enables the fungus to persist for a number of years on the dead organic material in the soil, although it eventually tends to die out.

Thielavia basicola is characterised by the production of three kinds of spores, known as endoconidia, chlamydospores, and ascospores. (See Fig. 1.)

The endoconidia are produced by special structures (the endoconidiophores) which arise singly or in clusters from the mycelium or thread-like portion of the fungus. The endoconidiophores are branches of the mycelium terminated by a long tapering cell, through which the endoconidia are discharged. They are colourless, rectangular cells, very slightly rounded at the ends, and are produced in great numbers. Doubtless they serve as the most prolific means of dissemination of the disease.

The chlamydospores are dark club-shaped structures, which may be produced just below the endoconidiophores or on any other portion of the mycelium. They are compound spores made up of sterile cells, which

are colourless, and fertile cells, which are dark-brown in colour and are surrounded by thick walls. The latter eventually separate into short cylindrical individual cells, each of which is capable of germination. Unlike the endoconidia, they do not germinate immediately, and may remain in a resting condition for a considerable time.

Both endoconidia and chlamydospores have been found on local diseased material. The ascospores, which are sexually produced, and which form another stage of the fungus, have not so far been observed here.

The Australian fungus was also compared with a culture of *T. basicola* from Minnesota, U.S.A., kindly supplied by Mr. W. L. Waterhouse, of Sydney University. The essential features of the Australian form were in close agreement with those of the American form.

Tobacco crop at Tumut affected with Root-rot.
Note the very uneven stand which is a characteristic of the disease.

Preliminary Infection Experiments.

Several infection experiments were carried out under glass-house conditions at Sydney. The details of one experiment are as follows:—Two tobacco seedlings, each showing seven leaves and identical in appearance, were used. One was inoculated with a suspension of spores of *T. basicola* isolated from a diseased plant at Bathurst. The other was kept as a control, and both received precisely the same subsequent treatment. No facilities were available for controlling the temperature, but it was kept as low as possible.

It was observed three weeks after inoculation that the inoculated plant was slightly stunted. A month later this difference was more marked, and its leaves were rather pale and flaccid. The experiment was terminated ten weeks after its commencement, and the roots of both the control and the infected plant were carefully washed free of soil and examined. It was

observed that the roots of both plants were affected by eelworms (*Heterodera radicicola*), and consequently they were both stunted for this reason. Nevertheless the inoculated plant was now much smaller than the control and showed definite symptoms of the black root-rot disease. Chlamydospores of *T. basicola* were found on its roots, whereas the roots of the control plant were white and free from any fungous infection. Details of height and air-dry weight of each plant were as follows:—

	Height.			Weight.		
	Stem.	Roots.	Total.	Stem.	Roots.	Total.
	Inches.	Inches.	Inches.	Grammes.	Grammes.	Grammes.
Control Plant	26½	9	35½	83·2	9·7	92·9
Inoculated Plant ...	16¼	4½	20¾	35·1	3·0	38·1

An additional test was made in the laboratory. Moist blotting-paper was placed on the bottom of four sterile glass petri-dishes and sterilised tobacco seed was sprinkled over its surface. When the seed had germinated and the seedings were well up a water suspension of the spores of *T. basicola* was poured over the plants in two of the dishes. The other two were kept as controls. Twelve days after treatment it was observed that some of the inoculated seedlings had fallen over and were lying on the surface of the blotting-paper. The microscopic examination showed that they were affected with *T. basicola*. The seedlings in the control dishes remained healthy.

Relation of Weather Conditions to the Disease.

Johnson and Hartman (²) in a series of control experiments in America on black root-rot found that plants were not attacked when the temperature was above 90 deg. Fah., and were only slightly affected when below 59 deg. Fah. The severity of the disease was most marked at soil temperatures ranging from 63 deg. to 73 deg. Fah. In conclusion, they state that "Soil temperature records in the field for four seasons indicate that occurrence of the disease is determined primarily by soil temperature." The disease thus causes most damage during relatively cool weather.

Temperature records* for Bathurst, Tamworth, and Adelong (Tumut) are indicated graphically in Fig. 2. They show the average monthly temperature readings from September, 1926, to March, 1927, and also the normal temperatures experienced in these districts for the same months over a considerable number of years.

It will be noted that the past season was generally cooler than usual. This was especially marked from November to January, and it was during this period that the tobacco was most notably stunted. Further, it will be seen from the Bathurst records that this season's temperatures remained

* Temperature data from records of Commonwealth Meteorologist.

below normal throughout the season, and there, as previously indicated, the crops did not recover. On the other hand, at Tamworth, after January the temperatures were practically normal, and it was in this district that the recovery of the crop was most marked. At Adelong the temperatures rose until they were higher than normal in January, but then they dropped, and

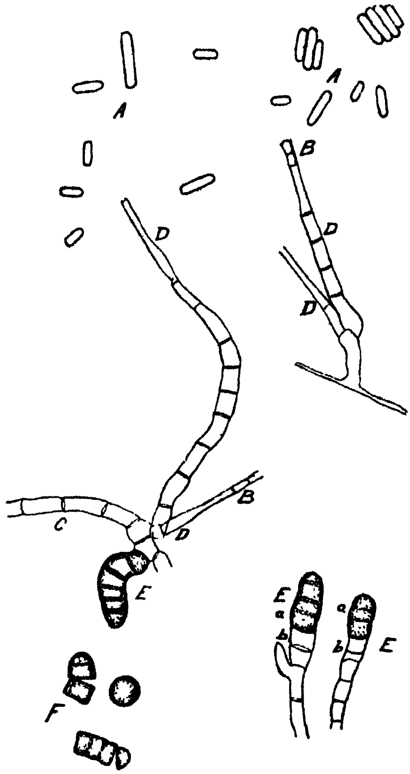


Fig. 1.—Microscopic Characters of *T. basicola*.

A. Endoconidia.
B. Endoconidia before being discharged from endoconidiophores.
C. Mycelium.
D. Endoconidiophores.
E. Chlamydospores—
(a) Fertile cells.
(b) Sterile cells.
F. Chlamydosphores breaking into segments.

were below normal during February and March. Hence, unlike Tamworth, the temperatures there did not remain above normal after January, and there also the crops did not recover entirely as at Tamworth. It will be seen, therefore, that abnormally low temperatures were closely associated with stunted crops.

Tobacco thrives best in warm weather, the temperatures for its optimum development have been recorded by Jones *et al* (7) as being from 68 deg. Fah. to 77 deg. Fah. The cool weather experienced in the New South Wales

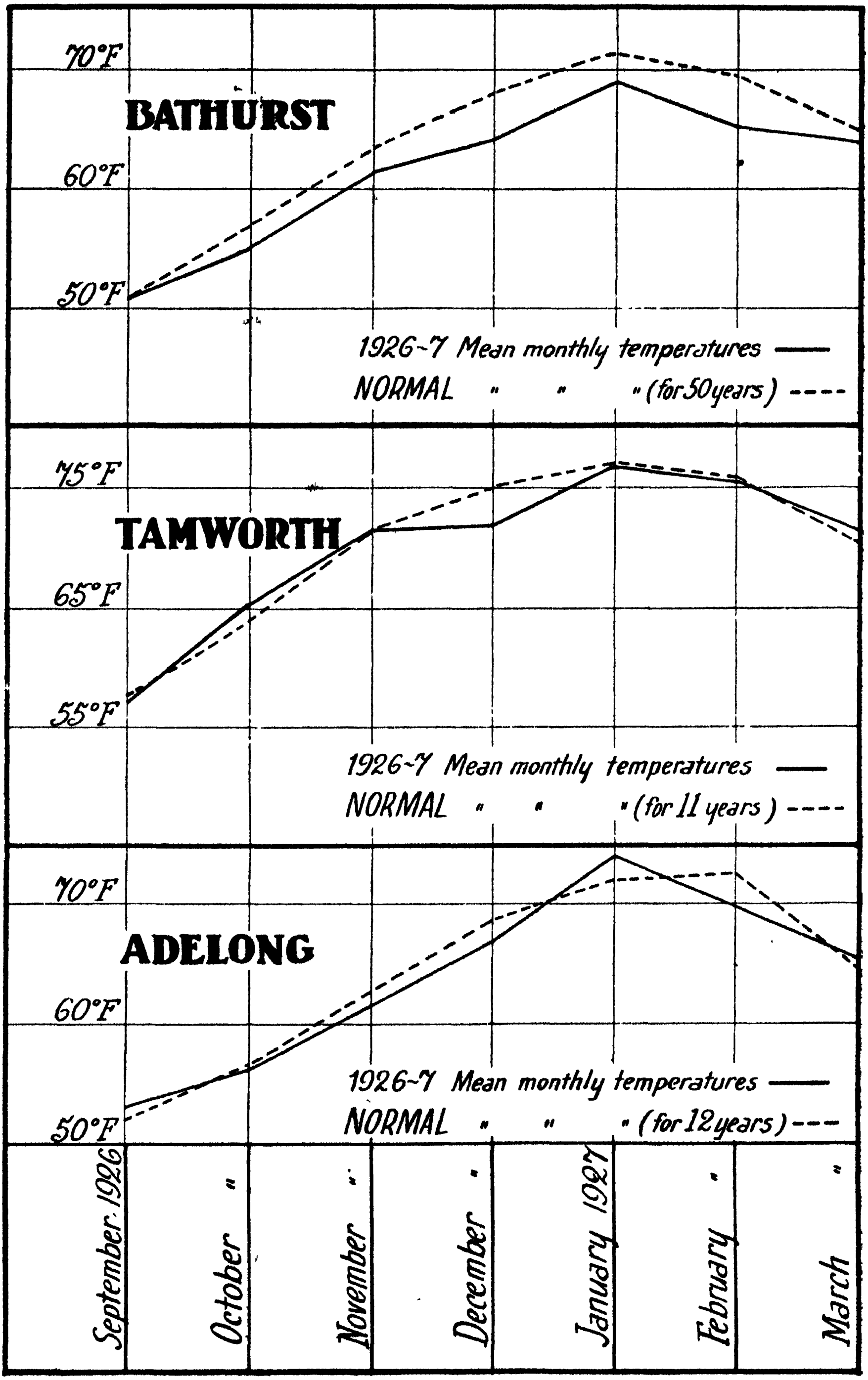


Fig. 2.—Graph showing Mean Monthly Temperatures at Bathurst, Tamworth, and Adelong.

tobacco districts was therefore unfavourable for its best development, and probably in itself was responsible for some of the stunting. This, however, is not the complete explanation. The same authors (4) report the results of careful observations on the occurrence of root-rot and on the prevailing temperatures during the period 1915-18 in the United States. They found that the 1915 season was exceptionally cold throughout, and in many fields there was a complete failure of the tobacco crop. "On the other hand," it is stated, "many excellent crops were grown where root-rot was not present,

Root-rot Infection Experiment.

A Healthy plant.
B Plant inoculated with *T. basicola*.

[Note the blackened scanty root system and stunted growth in B]

indicating that the weather conditions, apart from infection, were not responsible." One may arrive at a similar conclusion with reference to the past season in New South Wales. The weather was exceptionally cold, and the fungus which is the cause of black root-rot, was found in the various districts where stunting occurred. Hence, although the low temperatures themselves may have been partly responsible, the major cause of the trouble would appear to have been black root-rot, which was able to cause severe damage because of these temperatures.

The relation of rainfall to the development of the disease has been studied, and Tisdale (10) working on the disease in Florida has pointed out that affected plants may remain stunted until the summer, and with favourable

rains start suddenly into rapid growth. But he adds, "on the other hand, if the rainy period should be of several days duration, the new roots rot and the plants fail to start this rapid growth."

Heavy rain was experienced after a dry period in many districts in New South Wales in December last year. At Bathurst and Tamworth the rainfall was in excess of the average for the month by 92 points and 268 points, respectively, which may have accentuated the trouble.

Although we have the fungus which causes black root-rot of tobacco in our soil, there is no reason to anticipate that the damage done this season will be of frequent occurrence, since little damage or none at all occurs when temperatures are normal. It is apparent that it has been present in our tobacco soils for many years, otherwise it would not now be so widespread. The fact that attention has not been drawn to its presence before is an indication that it does not manifest itself frequently in a very severe manner.

Control Measures.

1. Seed-beds should be made of soil which has not grown tobacco or other susceptible crops for many years. As an alternative the soil may be sterilised before use. It is particularly desirable that seed-beds be free from infection, since the disease is most disastrous during the cool weather, which is most likely to occur early in the season.
2. Only strong, healthy plants with a clean root system should be planted out.
3. Land which has carried diseased crops may be freed from the fungus by starving it out. To accomplish this the land should remain idle for from four to eight years, or some crop not susceptible to the disease should be grown for a similar period. Some such crops are maize, small grains, and those vegetables which are resistant to the disease.

The most promising method of control is the use of strains of tobacco resistant to black root-rot. Considerable success has been obtained in the United States (5) and (6) in breeding such strains. This year a few more or less resistant plants were selected for seed in order to initiate this work in New South Wales.

Conclusions.

It is impossible to indicate just how much damage was caused by this disease in the seed-beds during the early part of this season, since an investigation was not made at that time. It is reported that insects caused considerable loss, but since the fungus *T. basicola* was present in the soil, and since the temperatures then prevailing were even more favourable for its attack than later in the season, it is possible that it also caused losses at this period.

The phenomenal dwarfing of tobacco observed in the field during the past season must be largely attributed to the effects of the black root-rot disease during a season particularly favourable to its attack.

LITERATURE CITED.

[1] Berkeley, M. J., and C. E. Broome. Notice of British Fungi, Ann. and Mag. Nat. His. s. 2, 5: 461 London 1850.

[2] Johnson, James, and R. E. Hartman. Influence of Soil Environment on the Root-rot of Tobacco. Jour. Agric. Res. 17: 41-86, 1919.

[3] Johnson, James. Tobacco Diseases and their Control. U.S. Dept. Agric. Bul. 1256: 18-21. 1924.

[4] Johnson, James. Host Plants of *Thielavia basicola.* Jour. Agric. Res. 7: 289-300. 1916.

[5] Johnson, James, and R. H. Milton. Strains of White Burley Tobacco Resistant to Root-rot. U.S. Dept. Agric. Bul. 765, 1919.

[6] Johnson, James. Resistance in Tobacco to the Root-rot Disease. Phytopath. 6: 167-181. 1916.

[7] Jones, L. R., James Johnson, and James G. Dickson. Wisconsin Studies upon the Relation of Soil Temperature to Plant Disease. 40-48, 1926.

[8] Peglion V. Marciume radicale delle piantine di tabacco causato della Thielavia basicola Zopf. Atti R. Accad. Lincei. an. 294, s. 5, Rend. Cl. Sci. Fis. Vol. 6, semestre 2, fasc. 2, pp. 52-56, Roma 1897.

[9] Selby, A. D. Tobacco Diseases and Tobacco Breeding. Ohio Agric. Expt. Stn. Bul. 156, Ohio 1904.

[10] Tisdale, W. B. Tobacco Diseases in Gadsen County in 1922. Florida Agr. Exp. Stn. Bull. 166: 105-106, 1922.

[11] Zopf, W. Thielavia, genus novum, Perisporiacearum. Verhandl. Bot. Ver. Prov. Brandenburg, j. 18, Sitzungsber. 30 Juni, 1876, 101-105. Berlin 1876.

(Acknowledgment is made to Mr. P. Maguire for assistance in the photographic work).

FOREIGN FARMERS ACTIVE IN CO-OPERATION.

FARMERS in foreign countries take an active part in the co-operative marketing movement. It is reported that in Bulgaria out of 398,304 co-operators, 164,282 are farmers. In Japan, of the 2,729,000 co-operators, 77.8 per cent. are farmers. In Lithuania the membership of 140,000 shows 67.5 per cent. as farmers. A large Polish co-operative union with 280,000 members registers 37 per cent. farmers. Rumania reports 646,332 farmers out of a total of 717,491 co-operators. Finland in 1922 had 334,600 co-operators of whom 49.4 per cent. were farmers and agricultural workers, while Latvia gives a total of 88,665 co-operators of whom 36.2 per cent. are farmers and farm workers.

The number of farmers in the movement in Sweden has increased 600 per cent. since 1910, while the industrial workers amounted to only about 300 per cent. In Germany the percentage of co-operator farmers has increased more than 500 per cent. and that of industrial workers only 400.

AN International Exhibition of Horticulture and branch trades will be held at Brussels between the 10th and 18th September of the present year. Further information is obtainable from the Belgian Consul-General, Sydney.

Making a Home-made Cheese.

A. B. SHELTON, Dairy Instructor.

A TYPE of cheese suitable for home manufacture and home use can be made with very little special plant.

The night's milk should be perfectly sweet, and when mixed with the morning's milk should show no sign of sour smell or flavour. Add a pint of starter, or clean soured milk, stirring thoroughly into the bulk. The rennett, at rate of 1 dram to 3 gallons of milk, is first diluted in water, and then, after bringing temperature of the milk to 86 deg. Fah., is quickly stirred in. In forty-five minutes the milk should firmly coagulate and be fit to cut. Care should be taken not to bruise the curd and cause excessive loss of fat in the whey.

To cut the curd, a long carving knife may be used to first slice the curd into vertical slices and then to cut the slices cross ways; then a wire breaker, or series of wires stretched across a frame, to which a handle is attached, is used to draw through the curd and reduce it to small cubes. After cutting, the curd should not be disturbed for ten minutes, when it should be stirred gently and the temperature gradually raised to 98 degrees Fah. by withdrawing a portion of the whey into a bucket, standing it in boiling water and heating to about 130 degrees Fah., and then returning it to the bulk, repeating the operation till the desired temperature is reached.

While the whey is still sweet, but the curd having attained a feeling of firmness, ladle the curd into coarse cloths and then tie up tightly, plum pudding fashion. After half an hour, cut into 3-inch blocks, putting the outside of the curd inside, tie up again and turn the bundle over; this procedure is repeated once or twice. After one hour and a quarter sufficient acid will have developed in the curd for salting. It should at this stage draw rather less than ½-inch threads when a small piece is rubbed on and withdrawn carefully from a hot iron. The curd is then broken up into small pieces and salt applied at rate of 1 oz. to 3 lb. curd, mixing it in thoroughly. When the salt has been absorbed the curd is ready for moulding and pressing.

The curd is filled into tin moulds or hoops lined with clean cloth, and a wooden follower, made to slip into the hoop, is placed on top of the cloth. Pressure is applied gradually by means of lever arrangements for about twenty hours, and then the cheese is removed from the moulds to a cool atmosphere. The rinds may then be wiped occasionally with a cloth dipped in brine.

This cheese is very palatable if allowed to cure for a week or two, providing it is made from clean milk. Under the Dairy Industry Act, 1915, cheese must not be manufactured for sale unless premises are registered.

The History of Fertilisation in Plants.

G. P. DARNELL-SMITH, D.Sc. F.I.C., F.C.S., Biologist and Director of the Botanic Gardens.

All plants must breathe, feed, and reproduce themselves or the species will become extinct; to reproduce themselves they must be fertilised. We distinguish to-day between pollination, the mere transference of pollen and fertilisation, the process which succeeds the transference of pollen to the stigma of a flower.

From observations upon palms, Theophrastus (287 B.C.), and other ancient writers realised in a vague sort of way that pollen was in some manner connected with the production of fruit. Yet all that was known in the 16th and the beginning of the 17th centuries of the phenomena of life in plants was scarcely more than had been learned in the earliest times of human civilisation. The discovery of the circulation of the blood by Harvey in the 17th century gave rise to a comparison of certain phenomena in vegetable life with the propagation of animals, and paved the way for the discovery of sexuality in plants.

R. J. Camerarius (1691-1694) made some decisive experiments on the necessary co-operation of pollen in the production of seeds capable of germination, but there followed a period of little progress in the understanding of sexual phenomena in plants, until Koelreuter (1760-1770) added much new light by his experiments on the artificial production of hybrids. The first artificial hybrid in the plant kingdom ever produced appears to have been made by him in 1760, when he crossed the tobacco plants *Nicotiana rustica* and *Nicotiana paniculata.* He was the first to point out the connection between pollination and insect life. Later he produced a considerable number of hybrids in the genera *Nicotiana, Ketmia, Dianthus, Matthiola,* and *Hyoscyamus.*

Sprengel in 1793 conducted work in great detail and drew attention to the adaptation of flowers for insect fertilisation. In 1849 K. F. Gaertner published two books dealing with the results derived from twenty-five years of research. His experiments in hybridisation, of which he kept exact accounts, exceeded the number of 9,000. He critically examined every subject bearing on his work, and proved that the co-operation of pollen was indispensable to the formation of the embryo in the growing seed. Great as Gaertner's work was, he failed to recognise the importance of Sprengel's work and to connect it with his own. It was left to Darwin's wonderful talent for combination to sum up the products of investigations of a hundred years and to furnish the necessary logical and historical consummation, which he did in "The Origin of Species" (1859) and "Animals and Plants under Domestication" (1868).

* Summary of Lecture delivered before the Horticultural Association of New South Wales on 17th February, 1927.

The actual method of fertilisation in flowering plants was discovered by Amici, who found in 1823 that each pollen grain that falls upon a stigma forms a pollen tube, and in 1830 he not only followed the pollen tube into the ovary of the plant, but also observed that a pollen tube finds its way to every ovule that becomes fertilised.

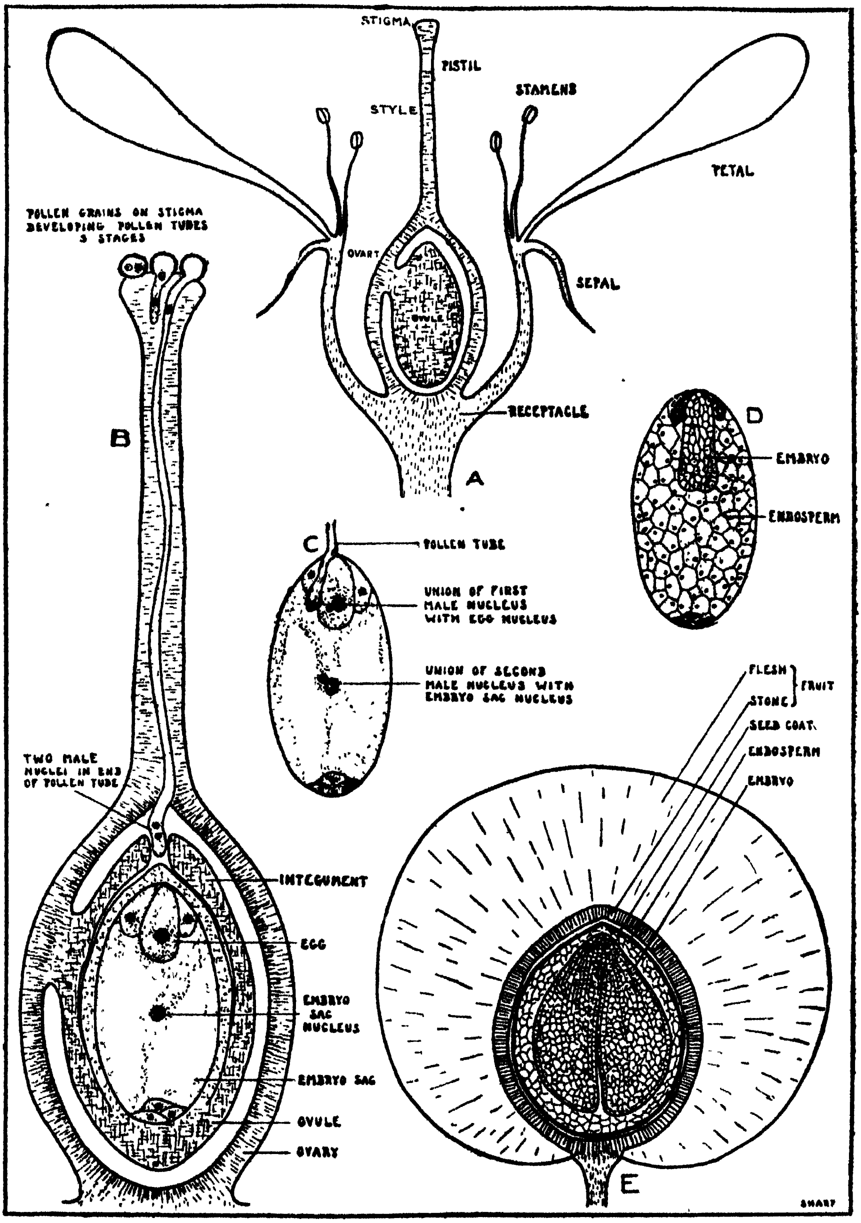
The discovery of the organs of fertilisation in the mosses in 1837 by Unger, and of corresponding forms in ferns by Nageli in 1844, was followed by the work of Hoffmeister on ferns and conifers. To Hoffmeister must be given the greatest credit and honour, for at one stroke he swept away all the old false analogies and enabled a comprehensive outlook over the vegetable kingdom to be taken, where the various groups could be observed in their proper relationships and their methods of fertilisation compared.

From 1850 to 1860 a number of fundamental facts were discovered, particularly in the lower plants, and by 1875 a fairly clear view of things had been obtained. We then find the great botanist—Sachs—stating that, "With respect to the true nature of fertilisation itself, which is evidently a similar process in the main in animals and plants, we can only say at present that it amounts in all cases to a material blending together of the contents of two cells, neither of which is capable of further development by itself, while the product of the combination is not only capable of such development, but unites in itself the characteristics of the two parent forms and transmits them to its descendants. The male fertilising substance may be a simple fluid."

To-day we know that fertilisation in flowering plants is not brought about by a simple fluid, but by two specialised portions of the protoplasm within the pollen tube, the so-called "generative nuclei"—one of which, by fusion with a nucleus in the ovule, goes to produce the future embryo plant; the other, by fusion with another nucleus within the ovule, goes to form the first food material upon which the little embryo will live.

The nucleus is a specialised portion of the protoplasm to be found within every plant cell, and it is interesting to note that it was first discovered by Robert Brown, a botanist who came with Flinders to Australia in 1801 and returned in 1805 with some 4,000 Australian plants, most of which were then new to science. His examination of *Kingia*, a West Australian species, led him to give the first correct account of the structure of the young seed. His memory is perpetuated by the letters "R.Br.," which we see appended to the Latin names of so many Australian species, and his work is remarkable for the very little of it which has had to be undone.

Since the time of Brown the microscope has been improved tremendously; the magnifications which one can now obtain are enormous, and more important still, the images are clear. Naturally, a vast amount of work has been concentrated upon the nucleus, and that work has demonstrated not only that it divides always into two before the formation of a new cell, but that it does so with almost mathematical precision. Minute, deeply staining, microscopic threads which permeate the nucleus are found



Main Steps in the Development of the Seed and the Fruit from the Flower.

These diagrams are based in general on the cherry, but for the sake of clearness, proportions have been somewhat altered, and many unimportant details have been omitted.

(*A*) Longitudinal section of cherry flower. (*B*) Pistil, showing structure of ovule and development of pollen tubes. (*C*) Embryo sac with double fertilisation in process. (*D*) Development of the embryo from the fertilised egg; the endosperm has developed and filled the sac. (*E*) Longitudinal section of a nearly ripe cherry. When fully mature the endosperm will have been entirely digested by the embryo, which will fill the seed completely. The seed coat in the cherry is only a brown paper lining of the pit.

[*From Cornell Reading Course for the Farm, Lesson* 144.]

to marshal themselves, split longitudinally, and rearrange themselves into two equivalent star-shaped masses, as if they were being directed by some supreme authority. Moreover, in many cases the actual number of these minute threads in each nucleus (which itself can only be seen by a high magnification) has been determined, and has been found to be constant for a given species, and further, that when that species is about to reproduce itself the number in each reproductive cell is reduced by half, so that, when fusion between the reproductive cells takes place, the resultant bodies shall start with the exact number of these minute threads peculiar to the species.

Parallel with this work we find what may be described as one of the tragedies and romances of biology. In 1865 Mendel, the Abbot of Brunn, published a paper embodying the results of years of work, in which the mode of inheritance of seven different characters of peas was investigated This paper at the time failed to attract any attention, and it lay buried until 1900, when de Vries dug it up through having seen a chance reference to it. Here was found the first and one of the most solid contributions to the method of inheritance in plants. Mendel's results with peas have been verified, and have been confirmed over and over again in experiments with other plants, and, moreover, the interpretation which he gave of his results still holds good.

From the point of view of the practical breeder, the point which emerges is that generally we are dealing with unit characters, and that while some of these may be masked in the first hybrid generation, they will segregate out in the second generation. The value, therefore, of raising all the plants of this generation is obvious. It is also obvious that hereditary characters are conveyed by the nucleus, minute though it is. A connection naturally suggests itself between hereditary characters and those minute threads which divide in such an orderly manner which form so large a part of the nucleus.

Let us return once more to Darwin. He summarised in a masterly manner the work of his predecessors, and explained the origin of species, not by regarding each and every one of them as a separate work of the Creator, but as being derived as a result of natural selection acting through immense periods of time. All species, according to him, were varying ever so minutely as a result of fertilisation, cross-fertilisation being necessary to maintain vigour. From a variety of infinitesimal variations, the fittest, that is, those that fitted in best with their environment, were able to survive.

Great as was Darwin's generalisation, subsequent investigations have shown that it is not universally applicable. Sudden variations occur which are not minute, but which are enormous, and to these sudden variations de Vries has given the name of "mutations." He discovered mutations occurring naturally in the evening primrose in 1901, several new species of which he described. Here again we must look for the explanation in the ultimate constituents of the nucleus.

Again, one of the reasons why the value of Mendel's results was not at once recognised was that the world was not ready to receive them. Unconsciously Weisman did much to effect this preparation. His main contention, in his great work on the germ-plasm, was that it is the contents of the germ cells that are all important, and not the body of the animal or the plant, which merely acts as the temporary means of transport of these immortal units.

To-day we have advanced in another direction. Several eminent botanists, for example, Jeffreys and Lotsy, are inclined to the view that hybridisation occurs naturally in a large number of native plants, particularly in those orders such as the *Rosaceae*, which are very large, and that so far from these hybrids being, as it were, temporary freaks which would be eliminated by natural selection, with the fresh vigour characteristic of a hybrid and the wide variation to be expected from their progeny, they start life with an even greater chance of propagating their species than pure types. Here again an examination of the structure of the neucleus with its minute threads has revealed to a very large extent what constitutes a hybrid, and the reason why the production of hybrids is limited to plants having certain degrees of affinity. At the present time work is proceeding largely in this direction.

Vignerons' Requirements for Nursery Stock.

Attention has been drawn on various occasions to the difficulty experienced by the Department in gaging the requirements of vignerons for bench-grafted and resistant rootling vines, and the necessity for orders being placed early enough to enable the requisite number to be arranged for each year has been pointed out. The variety of scions and stocks required for different soil and other conditions is so great, and the fact that under the most favourable circumstances more than 40 or 50 per cent. of strikes among the bench-grafts cannot be expected, combine to make a very large amount of nursery work inevitable. It was with a view to reducing this that growers were asked this year to place during the month of May, 1927, their orders for planting in the 1928 season. The response on the part of growers has been very poor this year, notwithstanding that several reminders have been offered through the newspapers, but the attention of growers is drawn to the fact that in other years orders will require to be placed by the 1st May, and to be accompanied by the usual 10 per cent. deposit.

The Success of Co-operation in U.S.A.

The increase in business of the co-operatives in the last ten years, and the small proportion of failures, have borne remarkable testimony to the soundness of the co-operative idea as applied to agriculture.

The distinctive feature of agricultural co-operation, as now successfully practised, is the tendency to large overhead community organisations. It is an application of the principle of large-scale business, which has become an outstanding factor in modern industrial life, to agriculture.—W. M. Jardine, Secretary for Agriculture, U.S.A.

Why Not More Pigs?

A Plea for the Greater Development of the Pig Industry in New South Wales.

[Concluded from page 486.]

W. L. HINDMARSH, M.R.C.V.S., B.V.Sc., District Veterinary Officer (North).

Insufficient Knowledge and the Fear of Disease.

Turning now to other reasons given for the neglect of pig-raising in this State, we may discuss together the second and third factors mentioned above, since they are interdependent, and most of the diseases that are prevalent in the State can be controlled by adherence to the principles of hygienic management.

There is no doubt that few farmers realise that the pig requires proper attention, and that care and management are just as much a study as the management of any other class of animal. Looked upon as a scavenger and a necessarily dirty animal, the pig is rarely given the opportunity to keep clean and comfortable. Little or no housing, filthy feeding conditions, undrained and dirty yards are his usual lot in life. As a result losses are constant, due entirely to lack of knowledge of feeding and sanitation.

Some four years ago it was estimated by one witness before the Select Committee of Inquiry into the Agricultural Industry that 50 per cent. of the pigs born did not reach the market, and our experience substantiates this opinion to a large degree. Nor is it only the pigs that die that cause loss, for it is an established fact that a pig which is sick when young receives a setback from which it never recovers. It becomes unthrifty and difficult to fatten. Where diseased pigs have thus proved a loss to the farmer, it is not surprising that the industry has stagnated. Pneumonia, paralysis, digestive troubles, infestation with parasites, and other diseases are so common that it is easy to see that pigs are often unprofitable to rear.

The point to be borne in mind is that *the majority of the losses from disease can be prevented,* provided the farmer is prepared to take the steps necessary to make his management conform to the laws of hygiene. To deal with this subject fully would only be to recapitulate the contents of a pamphlet issued by the Department of Agriculture,* copies of which are available without charge on application to the Under-Secretary.

The great advantage enjoyed by the New South Wales farmer is that he has little to fear from that scourge of other pig-raising countries—swine fever. In America this disease causes enormous losses, and to protect his

* "Hygiene in the Piggery. The Main Factor in Control of Disease." Published by the Department of Agriculture, Sydney.

pigs the farmer is compelled to employ preventive vaccination. No swine fever has been reported in this State for some years past, and that fact relieves the farmer of much anxiety.*

The Requirements of the Market.

Under this heading we may for convenience discuss the fourth and fifth reasons mentioned above as often urged by farmers for their neglect of pig-raising.

When discussing the question of pig-raising farmers point out that there is a variation in the price paid for pigs and the weights demanded at the bacon factories. It is usual at present to demand a pig of about 125 lb. dressed weight, and should the pigs received at the factory deviate from this weight a lower price is paid per pound. This position is not sound. There is no reason why a heavier pig should not make equally good bacon, and the variation in the price should depend upon the quality of the flesh rather than on the weight. If this were done the breeder would be compelled to pay more attention to feeding practice, and there would be less over-fat bacon on the market.

In justification of this position it may be stated that the local demand is for small hams, and as a result there is a tendency to get away from the long, deep type of pig and to use the shorter, more rapidly fattening types. Even the Poland China, a pig developed for the production of lard, is used in this State for bacon production, not because it makes good bacon (it is far too fat for that), but because it matures quickly. In view of this, it appears that we cannot look to the local demand for the expansion of the industry, and we must turn our attention to the possibilities abroad. If we can develop an export trade, the market should be more stable, and there would be good reason to advise the production of more pigs.

Dr. G. F. Finlay, the authority on livestock who recently toured the farming districts under the ægis of the Royal Agricultural Society, was most emphatic on the question of export. He pointed out that at present there is a great opportunity for Australia to get a footing on the London market. England imports over fifty million pounds worth of pig products annually. These are mostly supplied by Denmark, Ireland, Canada, and the United States of America. In the opinion of economists, Denmark has reached the limit of her production, and Dr. Finlay stated that Germany was beginning to take pork from that country which had originally been sent to Great Britain. The Irish supply is limited, and the United States are exporting less to Great Britain as home demands are increasing.

As far back as 1922 the Agent-General for West Australia reported "that a favourable opportunity is presented for the export of pig products of this State to the United Kingdom. A large quantity of bacon and ham

* Unfortunately, since this article was written swine fever has broken out in the county of Cumberland. Strict control is being maintained and every effort is being made to prevent the disease spreading to other districts. The outbreak appears to have been due to pigs introduced from another State.—Ed.

arrives in port frozen. The demand from October to April is for pigs from 60 to 100 lb. weight, dressed, whilst there is an all-the-year-round trade in pigs from 100 to 180 lb."

In the Pig Breeders' Annual for 1921 Sir Daniel Hall, Chief Scientific Adviser to the British Ministry of Agriculture, made the following statement:—"One of the most dispiriting facts in connection with British agriculture is its failure to keep pace with the growing demand for pig products. Yet during all this time there has been a growing demand on the part of the public for both pork and bacon. The prices for all classes of meat, including pork and bacon, are likely to remain high for years to come, because the world's supply has been steadily outrunning the world's production."

Other authorities, both local and abroad, could be quoted to show that there is good reason to believe that there is a market in Great Britain for bacon and ham. With our advantages in the way of rearing pigs we should endeavour to capture this market, but in so doing we must take care that the right class of bacon and ham is exported, and ensure that the export product is marketed under control. There is reason to believe that merchants and others in Great Britain are already beginning to interest themselves in the potentialities of Australia as a bacon-producing country, and we should strike while the iron is hot.

In the *News Bulletin* of 29th December, 1926, we read the following under the heading of "The British Markets for Pig Meat":—

With the placing of the embargo on continental fresh meat, more particularly pork, by Great Britain, the possibilities of supplies being obtained from the Dominions are being freely discussed. A study of recent British statistics shows that Canada, New Zealand, Australia, and South Africa are expediting the shipment of all the surplus pork that has any prospect of success on the British market. . . . Australia and South Africa have not at present much of the right sort of pork to offer, but they are making a good beginning.

Pork is imported into the United Kingdom in the form of porkers proper and baconers, and . . . it is rather in the former that the destiny of the Dominions lies . . . opinion of business men in Smithfield that the embargo on continental fresh meats has come to stay, as the time cannot be foreseen when the continent will be entirely free from foot and mouth disease. This fact, says the writer of the article, should embolden Dominion producers to give increased attention to the breeding and marketing of pigs, particularly those of reasonable weight.

In this connection a report just issued by the British Ministry of Agriculture on the marketing of pigs in England should be interesting. According to this publication, imports of pig meat and lard into the United Kingdom in 1925 were valued at over £66,000,000, and of this sum £42,000,000 was spent on imported bacon.

. . . South African curers have for some time sent small experimental shipments of green sides to London, which have been individually inspected, placed with different firms for smoking, and immediately marketed. Reports on every consignment have been sent to South Africa, and photographs have been taken of the green and smoked sides so that the consignees can see where the condition does not meet the requirements of the British market. Photographs have also been sent of sides imported from other countries to enable South African curers to adjust their methods of butchering, grading, and treatment to meet the demands of the British buyer.

From this it appears that the other Dominions are also busy considering the possibilities of the British market, and we should make efforts at once to obtain our share of the trade. It is, of course, of no use for us to consider export unless we are prepared to produce the type of pig required. We cannot sit back and say, "This is the type of pig we produce; take it or leave it." We must study the demands of the English market and supply what is required. Before Denmark entered into the British trade experts were sent to London to find the kind of bacon that suited the British taste, and then they set out to capture the trade. The late Mr. C. S. McRae, in evidence before the Agricultural Commission, made the following statement:—

> I am given to understand from many sources that the main reason why we cannot get our bacon on the English market is that the English taste is different from ours. I went into the matter with representatives of British firms; we found that it might be possible to develop our trade on the London or English markets. . . . If we could induce our farmers to grow a percentage of pigs suitable for our own market and a percentage suitable for export, I think it would be for their ultimate good.

What the British Consumer Likes.

The British taste for bacon is different from ours, in that they demand larger carcases and streaky bacon. On many of our farms there are many lard type of pigs and not true bacon types. Even in our own markets the streaky bacon will command a larger sale than the fatter sorts. Many of the present pigs are too heavy in the shoulders and too light in the hams. Much of the trouble is due to the multiplicity of breeds in use.

The following is taken from an English publication to show the requirements of the markets:—

> The thickness of the layer of fat along the back must be uniform and not too deep. The fat must be firm and white, not yellow and oily. The flesh must be firm and of sufficient amount, and the pigs must be of uniform type and size.

This type of bacon is obtained by—

1. Breeding from the correct type of pig.
2. Feeding the pig correctly on a ration well supplied with protein and not overloaded with carbohydrate.
3. Giving the pig a sufficiency of exercise in the growing stage.

In Australia we have at the present time two breeds that are excellent for the production of high-class bacon, viz., the Berkshire and the Tamworth. In some cases the Berkshire has been so bred as to show a tendency to fatten too rapidly, but this can easily be remedied by crossing with the Tamworth. This cross has the additional advantage that it eliminates to a large degree the seedy cut in bacon (found in Berkshire sows), which is not liked by the British consumers. To market pigs that will appeal to the British public we will, therefore, have to alter the feeding, giving up the intense feeding on maize, and making use of a ration that will be scientifically adjusted to the production of better bacon. The pigs will require more grazing and exercise, so that the tendency to rapid fattening will be lessened and the development of flesh increased.

This will mean that the pigs will mature more slowly, but the advantage will be gained of a better class of bacon, and a carcase more suited to the demands of the export trade.

Summary.

To sum up the position, then, we may say—

1. We have in New South Wales the facilities for the production of far more pigs than are bred at present.
2. We are fortunate in being free from contagious diseases that cause great losses in other countries. The control of diseases that do occur lies largely in the hands of the farmer himself.
3. The expansion of the pig industry will depend to a large extent on the development of an export trade, and the development of that trade depends upon the production of the type of pig product suitable to the palates of the consumers in the country to which the export is made.

Rules for Calf Feeding.

There are a few golden rules to be observed in feeding dairy calves :—

1. Guard against overfeeding; a safe rule is always to keep the calf a little hungry.
2. Keep the animals growing thriftily, but do not get them fat.
3. Feed all calves individually in stalls, and weigh and measure each feed for each calf.
4. Only put out as much grain or hay as each calf will consume at a meal; uneaten roughage should be removed before the next feeding.
5. Observe cleanliness and regularity at all times; feed only in clean utensils, feed at regular hours, in regular amounts, and at a regular temperature.

—G. McGillivray, at the R.A.S. Animal Husbandry Conference.

Study the Buyers' Requirements.

"The conclusion to be drawn from the report seems to be that the fruit industry generally has much to gain by adopting methods of marketing which will enable produce to be put on the market in a manner more in accordance with the requirements of wholesalers and retailers. Agreement on standard grades and packages is one method which can hardly fail to be beneficial to the industry. In this connection, collecting centres, where the produce of many growers can be brought together, graded, packed, and sold under one management, appear to offer advantages. Another suggestion is the more extensive use of methods of storage and preservation."

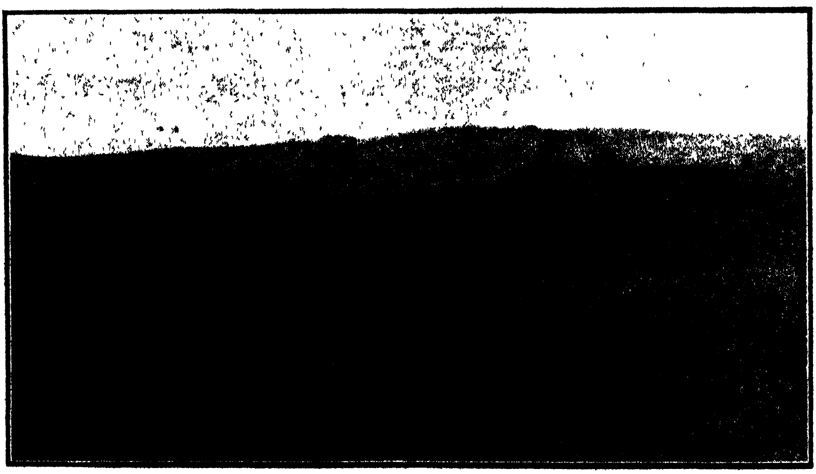
The above, from a report on "Fruit Marketing in England and Wales," published by the Markets and Co-operation Branch of the Ministry of Agriculture and Fisheries, closely approximates what might be written of the same subject in New South Wales, and encourages one to think that this systematic discussion of an involved problem may be of interest even here. —Our copy from the publishers, H.M. Stationery Office, London.

Paspalum Renovation and Improved Carrying Capacity.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

THE benefits to be derived by the renovation of paspalum pastures have been proved by Mr. G. E. Neale, of Fairfield, Bangalow, during the past few years. Towards the end of 1921 Mr. Neale purchased a farm of 108 acres (of which 13 acres were under cultivation), carrying sixty cows. In 1922 the area under cultivation was considerably increased to produce fodder crops, with the intention of increasing the returns, and a total of 9,635 lb. commercial butter was produced for the year.

Not being satisfied with these returns, Mr. Neale set out on a progressive policy by reducing his herd and improving his pastures. His method is to turn over old paspalum paddocks with a mouldboard plough, sow a fodder crop (maize or sorghum) broadcast, which is cut and fed as required, and then let the paddock go back to pasture. The effect of this

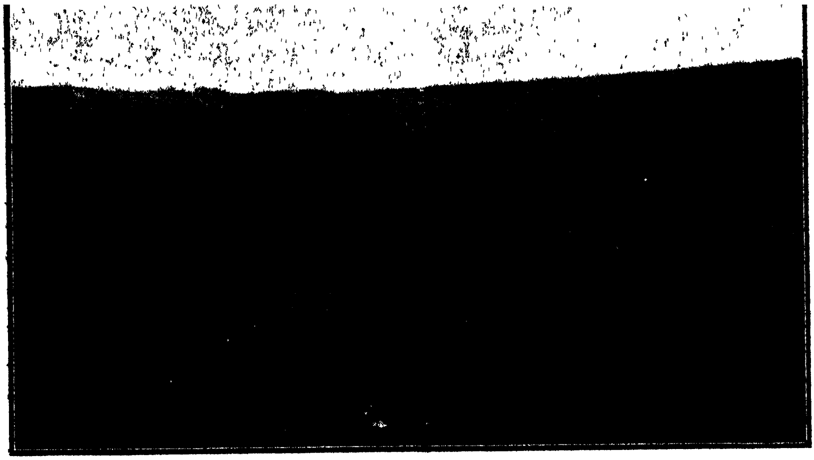


General View of Mr. G. E. Neale's Farm, "Fairfield," Bangalow.
The areas which have been ploughed are clearly indicated.

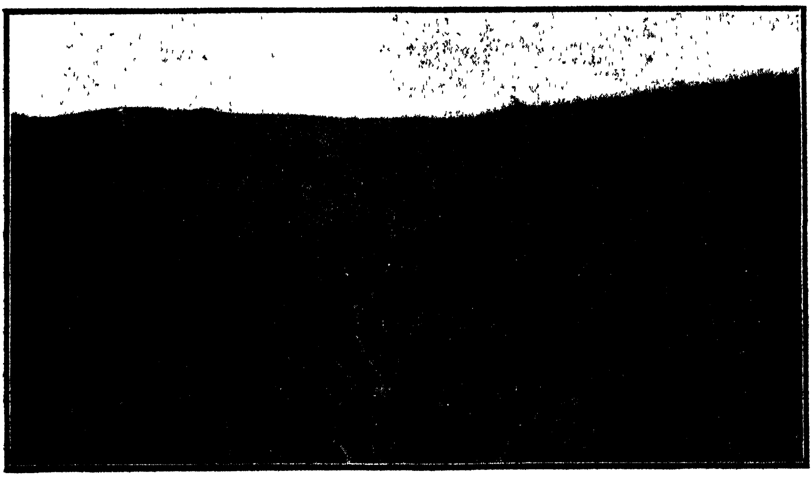
treatment is that a fresh growth of grass comes up between the furrow slices forming an entirely new root system, and the old paspalum sod decomposes and forms organic matter in the soil.

Thirty-three acres have now been treated in this way. In 1922, 1923, and 1924 fodder crops were grown extensively, but in 1925 and 1926, owing to labour difficulties, 5 acres only were planted each year.

In 1923, which was a very dry year, 7,603 lb. commercial butter were produced from forty-five cows; in 1924 the herd was further reduced to forty cows, which produced 10,511 lb. commercial butter for the year, and



An Area which has not been Ploughed.
Photograph taken 17th February, 1927



The Growth on an Area which has been Ploughed.
Photograph taken 17th February, 1927.

in 1925 the production was increased to 10,990 lb. In May of the following year (1926) thirty head of dry stock were purchased and were carried on the farm throughout the dry weather; the production for the year was 9,422 lb. commercial butter.

The number of cows quoted above for each year is the total cows on the farm—not the number actually milking. Taking the total number of cows, the production of commercial butter per cow for the past five years was as follows:—

1922—160 lb.	commercial	butter	per cow.
1923—169	"	"	"
1924—263	"	"	"
1925—275	"	"	"
1926—235	"	"	"

These figures indicate that great improvement has been made. Although 1923 was a very dry year, the production per cow was greater than in the previous year. In 1926, which was also a very dry year, when thirty head of dry stock were being carried on the farm, the results were very satisfactory.

It has been observed by Mr. Neale that the fresh growth of grass on the ploughed areas is always of a much darker green, and more vigorous than the unploughed areas. Such growth is sweeter, more nutritious, and more relished by stock, as is proved by the fact that where the stock have access to both poughed and unploughed areas the grass on former is always eaten to the ground before grazing on the latter is commenced.

It has also been observed that there is now a good growth of white Dutch clover over the whole area, which was not the case when he purchased the farm in 1921. Only certain areas were then carrying good clover. This extension of clover over the whole farm has been ensured by spreading the droppings from the milking yard over areas not carrying clover during the period when clover seed is ripening.

Mr. Neale considers that his farm is now in fairly good "condition," and is capable of carrying sixty-five cows. Thus the progressive policy of turning over a few acres of old paspalum pasture each year carries most satisfactory results.

The Value of Negative Experiments.

A "POSITIVE" result in field experimental work may be defined as one in which a treatment gives an increase, irrespective of whether it is profitable or not; a "negative" result is one in which no benefit is derived from the treatment.

It should be borne in mind that a negative result from a treatment is just as valuable a contribution to knowledge as is a positive one, for it is just as important to know when and where a certain application is likely to be of no avail, as it is to know when and where it is profitable. In any case there are always certain departures from the general state of affairs. If results were always concordant there would be no need for other than the minimum of experimental work. Sir A. D. Hall, in referring to the truth of results of field experiments, summed up the position in a very few words. He said, "There is no such thing as absolute truth, and what we find is that which is true as a whole, though it may be contradicted by parts of the whole."—A. W. HUDSON in the New Zealand *Journal of Agriculture.*

Onion Trials in New South Wales.

J. DOUGLASS, H.D.A., Agricultural Instructor.

EXPERIMENTS were conducted last season in the Maitland and Dubbo districts with the object of obtaining reliable data regarding onion-growing in this State. Trials were conducted to ascertain the most suitable varieties and with the object of observing the effects of fertilisers on the onion crop.

New South Wales imports large quantities of onions annually from Victoria and Tasmania, and occasionally from the United States of America, Japan, and other countries; the bulk, however, are brought over from Victoria. There is no reason why New South Wales farmers should not compete with outside growers, as there is plenty of suitable land for the production of this crop on a large scale. The most objectionable, tedious, and expensive operation is the weeding of the growing crop. Coastal growers have to contend with goose grass, which is a free seeder and very persistent in wet weather. Many growers in wet years collect it in baskets and carry it from the field. Western farmers, on the other hand, have other bad weeds to contend with.

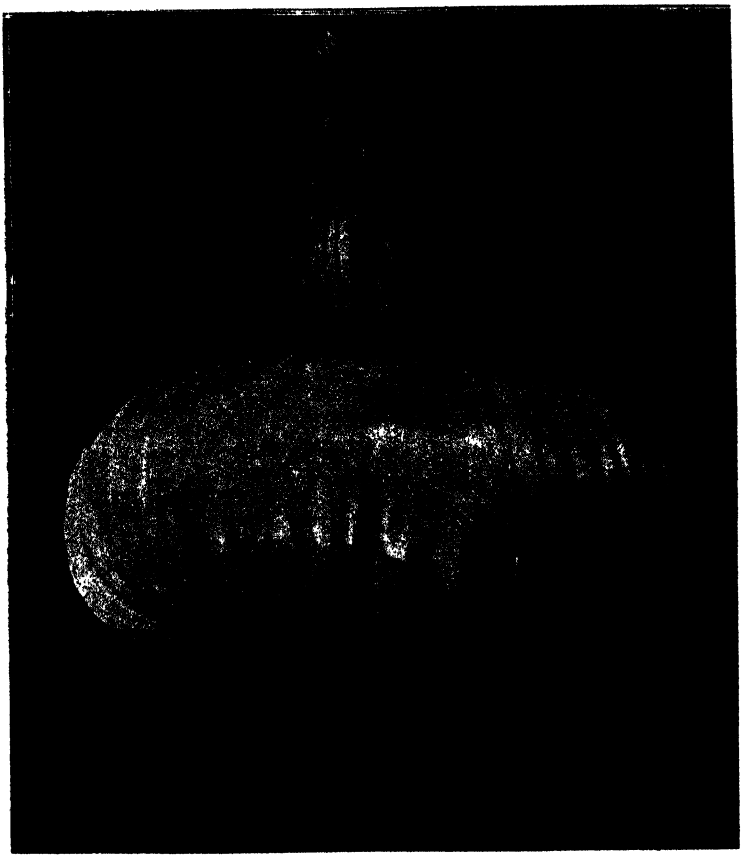
This cleaning trouble, however, can be greatly reduced by correct cultural methods before planting. By making the first ploughing deep, and keeping the mulch systematically worked with the springtooth cultivator and harrow, weed seeds will be induced to shoot, and can be easily killed before the onion crop is planted. It will be found that the subsequent weeding of the crop will be reduced to a minimum if this system of working the fallow is carried out. In districts where transplanting is carried out farmers have at least six weeks more time in which to cultivate the fallow than in districts where direct seed planting in the field is conducted.

In districts where a long fallow cannot be practised transplanting should always be carried out, as the time from seeding to transplanting can be used to destroy weeds and finish off the mulch.

Local growers usually obtain a good price for early onions, but as soon as the Victorian crop is placed on the market the demand for local onions weakens. The natural tendency, therefore, is for local farmers to grow early sorts. Large quantities of the earliest onions are grown on the banks of the Macquarie River at Bathurst, Wellington, and Dubbo. The varieties most commonly grown are Early Barletta and Silver Skin. A few growers in these districts use artificial fertiliser with marked results. On the Hunter River and in other coastal districts the variety grown is Hunter River Brown Spanish. This variety is somewhat mixed, but is superior in quality and yield to the white varieties. It has the reputation of being a bad keeper, but this has been brought about by growers harvesting the crop before it is mature. Little artificial fertiliser is used in these districts

The Manurial Trials.

The land on which these trials were conducted is deep, rich alluvial loam. Excellent crops have been grown in these localities without fertilisers, and the soil has proved itself to be very suitable for the cultivation of onions. The land in each case had been well prepared, and was in good condition at planting. At Bolwarra the seed was sown direct in the field in rows 10 inches apart on 28th April, 1926; at Dubbo the seed was sown in seed-beds



Early Barletta.

on 24th April, 1926, and later transplanted to the field 6 inches apart in rows 10 inches apart. Locally-saved Hunter River Brown Spanish was used as a standard variety.

In all cases an increased yield was obtained by using fertiliser. The outstanding feature of these trials was the high increased yield obtained by the use of P7. On the Hunter the increase over the unmanured plot was 3 tons 14 cwt. 2 qr. 26 lb., and at Dubbo 2 tons 6 cwt. 3 qr. 7 lb. With onions selling at £10 per ton this represents a gross increased return of

£37 7s. 4d. at Bolwarra and £23 8s. 1d. at Dubbo. As this dressing only costs approximately 28s. per acre, the increase leaves a remarkable profit. The superphosphate in this mixture is more readily available to the plant than the bonedust, and it is not until well into the spring that the plant food in the bonedust becomes available in any quantity; hence the mixture provides a more constant supply of plant-food over a longer period than other superphosphate mixtures. When it is remembered that onions occupy

Hunter River Brown Spanish.

the land for eight months, it will be seen how important this factor becomes. When the proportion of bonedust to superphosphate was increased to two to one, however, as in the mixture W3, a reduction on the P7 yields was obtained, due to the much slower action of this mixture. These phosphatic manures promote root growth and make the plants more resistant to dry spells. This was specially noticeable on the Hunter, where only 496 points of rain fell from July to November (inclusive). It was thought from observation that the mixture P7 had a tendency to mature the crop more quickly and evenly than the other fertilisers.

Very little can be said about the other mixtures in the trials, as the results are for one year only, and are not conclusive. At Bolwarra, where

the seed was sown direct in the field, basic superphosphate promoted an earlier germination than the other plots. Excessive amounts of nitrogen tend to produce large, soft, poor quality bulbs, which are difficult to mature and in many cases rot before harvesting.

Onions for Seed.

RESULTS of Manurial Trials.

Fertiliser.	H. Whitman, Maitland.				K. Marks, Dubbo.			
	t.	c.	q.	lb.	t.	c.	q.	lb.
*P7 378 lb. per acre	14	1	1	0	10	10	3	21
M3 546 ,, ...	13	1	3	24	8	5	0	2
M13 546 ,, ...	13	1	3	24	8	4	0	14
P3 672 ,, ...	12	13	3	20	9	14	1	16
W3 364 ,, ...	12	2	2	20	9	6	3	9
Basic superphosphate 495 lb. per acre	12	1	0	8	8	14	0	24
Superphosphate 420 lb. per acre ...	11	6	2	12	9	4	1	16
No manure (average)	10	6	2	2	8	4	0	14

* The fertiliser mixtures were made up as follows:—P7, bonedust and superphosphate in equal parts; M3, 10 parts superphosphate and 3 parts sulphate of ammonia; M13, 10 parts superphosphate and 3 parts sulphate of potash; P3, 10 parts superphosphate, 3 parts sulphate of ammonia, and 3 parts sulphate of potash; W3, 1 part superphosphate, 2 parts bonedust.

Variety Trials.

These experiments were conducted in a number of centres, but, with the exception of Mr. K. Marks, at Dubbo, all experienced trying conditions, with disappointing results. At Fairfield, Dubbo, Mr. J. C. Rowcliffe had the crop cut to the ground with hail in the early stages of growth, and later in the spring it was eaten out by cutworms. Mr. E. Mulholland, of Wallalong, was also troubled with cutworms. Many of the late maturing varieties failed to mature owing to the prolonged dry spell during the spring and early summer.

Of the varieties tested, Hunter River Brown Spanish stood out as the best all round variety. A strain selected by Mr. A. McKimm, of Bolwarra, proved to be about as early as Early Barletta. This selection has a mild, good flavour, is a good keeper, and matures evenly. Mr. J. C. Rowcliffe has also been selecting a strain of this variety. At Dubbo this selection was only beaten in yield by Odourless.

Early Barletta is a very early, flat, white onion of poor quality. It is extensively grown for bunching and the early market.

Odourless is a large, light-skinned onion of poor keeping quality. The flavour and aroma are remarkably mild, and the variety should be very suitable for home gardens.

RESULTS of Variety Trial.

Variety.	K. Marks.				J. C. Rowcliffe.				H. Whitman.			
	t.	c.	q.	lb.	t.	c	q.	lb.	t.	c.	q.	lb
Hunter R. Brown Spanish (J.C.R.)	8	4	0	14	5	19	0	8	8	2	1	8
,, ,, (A. McK.) ..	......	....			5	5	0	0	9	12	3	12
Odourless	9	16	3	9	4	15	3	20	....			
Prizetaker	8	1	2	2	5	4	3	12	....			
Early Barletta	6	16	1	5	....				7	3	0	4
Light Skin Brown Spanish	6	6	0	23	....				....			
Selected Long-keeping Brown Spanish	5	16	0	13	4	14	3	24	....			
Ailsa Craig	5	0	3	26	....				.. ..			

INFECTIOUS DISEASES REPORTED IN MAY.

THE following outbreaks of the more important infectious diseases were reported during the month of May, 1927:—

Anthrax	Nil.
Pleuro-pneumonia contagiosa	6
Piroplasmosis (tick fever)	Nil.
Blackleg	2
Swine fever	13

—MAX HENRY, Chief Veterinary Surgeon.

ROUGHAGE FOR DAIRY COWS.

ROUGHAGE is often the cheapest form of digestible nutrient, and cows should be allowed all the roughage they can consume. Maize silage and lucerne are probably the ideal roughage for a dairy cow, and they should be fed at the rate of 3 lb. of silage and 1 lb. of hay per day for each 100 lb. of live weight. Lucerne hay is much superior to non-leguminous hay for cows in milk; the non-leguminous hays are low in digestibility, tend to be constipating, and are low in protein and mineral matter; they are often useful in limited amounts when fed with some high quality lucerne hay.—G. McGILLIVRAY, at the R.A.S. Animal Husbandry Conference.

The Codling Moth.

(*Cydia pomonella*).

Part I.

S. L. ALLMAN, B.Sc. Agr., Assistant Entomologist.

A study of the bionomics of the codling moth and an investigation toward control were carried out at Bathurst Experiment Farm. This article deals with certain aspects of this research work, and it will be followed by further reports, including also bionomical data.

The codling moth (*Cydia pomonella,* L.) has long been regarded as the most serious pest of apples and pears, and it is now world-wide in its distribution.

The first serious outbreak in Australasia occurred in Tasmania in 1857, when a severe infestation of apples was recorded.[1] It has since made its appearance in South Australia, Victoria, Queensland, New South Wales, and more recently in Western Australia.

Description of the Insect.

The adult insect is a greyish moth, measuring about three-quarters of an inch across the outspread wings, and with a conspicuous bronzy patch at the tip of the forewings. The eggs deposited by the moths are round, flat, semi-transparent, and about the size of a pin's head. They may be seen in numbers in infested orchards upon the leaves and fruit, and are usually deposited singly.

The mature larva or caterpillar, which is responsible for the damage to the fruit, is yellowish white with a pinkish flush, and about three-quarters of an inch in length. It is the most commonly recognised stage of this pest. The larva, on reaching maturity, spins a cocoon in a sheltered place and transforms into a pupa or chrysalis, preparatory to changing into the adult moth. Some larvae remain unchanged in their cocoons throughout the winter and do not pupate until the following spring, when they give rise to a new generation of moths and thus the pest is carried over the winter period.

Hosts of the Codling Moth.

Although primarily a pest of apples and pears, outbreaks have been recorded in walnuts in the United States, and considerable attention has recently been devoted there to the control of the pest in these nuts. The larvæ have also been recorded feeding in quinces and crab apples, and rarely, on peaches, plums, apricots, cherries, oranges, persimmons, pomegranates, crataegus, damsons, chestnuts, and oak galls.

Control Methods.

The importance of destroying windfall fruit was early recognised, and the first attempts at control were carried out along these lines. The value of bandaging the trunks was accidentally discovered, and this system then became the most commonly used and the most successful method of control.

About 1870 spraying with paris green or white arsenic was recommended in America for the control of the apple canker worm.[3] Practical orchardists soon noted that the sprayings recommended also controlled the codling moth, and subsequently experiments were carried out by Cook, which substantiated this fact.

Careful field experiments were carried out with various arsenicals, and about 1890 all authorities seem to have agreed that the spraying method for the control of the codling moth was quite efficient, and that other methods, including bandaging and the destruction of windfall fruit, were no longer necessary.

Lead arsenate, at the rate of 1 lb. to 50 gallons of water was generally employed, and the belief was held that if every calyx cup and apple were thoroughly sprayed practically complete destruction of the codling moth larvæ would result. Poor control was attributed to incorrect timing of the spray, or lack of thoroughness in its application.

During the last few years it appears that unsatisfactory control is being obtained by the use of lead arsenate, in spite of improved methods of application and of more correct timing. The present spraying schedules call for one calyx spraying and two up to ten cover sprays, and the opinion is usually given that an increase in the amount of arsenate used is neither necessary nor of any value.

Control Methods at Bathurst Experiment Farm.

Owing to the uncertain status of spraying for the control of the codling moth, a number of experiments were carried out in Bathurst Experiment Farm orchard. The following sprays were tested during last season:—

(1) Lead arsenate, 36 oz. to 50 gallons of water.
(2) Lead arsenate, 18 oz. to 50 gallons of water, and white arsenic, 12½ oz. to 50 gallons of water.
(3) Lead arsenate, 18 oz. to 50 gallons of water.
(4) Calcium arsenate, 18 oz. to 50 gallons of water, and lime hydrate, 2 lb. to 50 gallons of water.
(5) Lead arsenate, 18 oz. to 50 gallons of water, and nicotine sulphate, 10 fluid oz. to 50 gallons of water.
(6) Lead arsenate, 18 oz. to 50 gallons of water, and lime sulphur 1½ gallons 28° B to 50 gallons water.
(7) Sodium arsenite, one-thirty-second oz. per gallon of water, further reduced to one-forty-eighth oz. per gallon of water; gelatine (sticker), 1·75 oz. per 10 gallons of water.
(8) Unsprayed (check).

The experiments were carried out with Jonathan apples, and ten trees were sprayed for each treatment. The spraying was carried out with rods fitted with angle nozzles, with an aperture of three thirty-seconds of an inch, and at a pressure of 175 to 200 lb. per square inch. Two calyx and four cover sprayings were applied. The first calyx application was given when about 50 per cent. of the petals had fallen, and the second

seven days later. The cover sprays were applied at intervals of three to five weeks, the applications being carried out on the following dates:—

20th October, 1926, 1st calyx spray.
27th October, 1926, 2nd calyx spray.
18th November, 1926, 1st cover spray.
9th December, 1926, 2nd cover spray.
5th January, 1927, 3rd cover spray.
11th February, 1927, 4th cover spray.

All trees, including the ten unsprayed trees, were bandaged and the bandages inspected at least every seven days until the end of the season In addition, windfall fruit was examined and destroyed at each bandage inspection. At each examination of windfall fruit, the number of larvæ in the fruit, the number of larvæ which had matured and left the fruit, and the number of blemishes or "stings," were recorded. A "sting" is a slight blemish on the skin of the fruit caused by the larva in its effort to burrow through the skin. In so doing a lethal dose of arsenic is ingested and only a slight blemish results. It may be taken, therefore, that the presence of a large number of stings indicates effective spraying.

RESULTS of Spraying Experiments.

Treatment.	Number of Fruit.	Number of Infested Fruit.	Number of Calyx Entries.	Number of Stings.	Per cent. Infested Fruit.	Per cent Calyx Infestation.	Ratio of Stings to Larvæ.	Number of Larvæ in Bandages.
1 Lead arsenate, 36 oz per 50 gals water..	1,765	444	6	1,058	25·16	0·34	2·36 1	70
2. Lead arsenate, 18 oz per 50 gals water, and white arsenic, 12½ oz. per 50 gals water.	1,815	672	16	1,058	37·03	0·88	1·54 1	83
3 Lead arsenate, 18 oz. per 50 gals. water.	2,329	978	36	1,703	41·99	1·59	1·65 1	187
4. Calcium arsenate, 18 oz. per 50 gals water, and lime hydrate, 2 lb. per 50 gals. water.	1,ƒ04	937	67	850	58·42	4·18	0 83 . 1	158
5 Lead arsenate, 18 oz. per 50 gals water, and nicotine sulphate, 10 fluid oz. per 50 gals. water.	1,800	664	35	991	36·89	1·94	1·34 1	115
6. Lead arsenate, 18 oz per 50 gals. water; and lime sulphur, 1½ gals. 28° B. per 50 gals. water	6,527	1,605	69	1,932	24·59	1·06	1·17 1	379
7. Sodium arsenate, $\frac{1}{32}$ to $\frac{1}{48}$ oz. per gal water	3,209	1,565	49	1,206	48·77	1·56	0·73 1	326
8. Check. Unsprayed ..	3,206	2,951	892	632	92·05	27·82	0·20 1	1,104

The treatments, ranged in order of merit according to the percentage of infested fruit and to the ratio of the stings to the entrances, are as follows:—

A.—PER CENT. INFESTED FRUIT.

1. Lead arsenate plus lime sulphur.
2. Lead arsenate 36 oz. per 50 gallons of water.
3. Lead arsenate plus nicotine sulphate.
4. Lead arsenate plus white arsenic.
5. Lead arsenate 18 oz. per 50 gallons of water.
6. Sodium arsenite.
7. Calcium arsenate.
8. Check. Unsprayed.

B.—Ratio of Stings to Entrances.

1. Lead arsenate 36 oz. per 50 gallons of water.
2. Lead arsenate 18 oz. per 50 gallons of water.
3. Lead arsenate plus white arsenic.
4. Lead arsenate plus nicotine sulphate.
5. Lead arsenate plus lime sulphur.
6. Calcium arsenate.
7. Sodium arsenite.
8. Check. Unsprayed.

The ratio of stings to entrances is probably the best guide to the relative efficiency of the various sprays. The more effective the spray, the higher the number of stings, except possibly in the case of a very quick acting poison or a deterrent. Taking the total number of stings and entrances it is possible to ascertain the percentage of mortality of the larvæ producing blemishes. The following figures are thus obtained for the various sprays used:—

Treatment.	Per cent. mortality.	Per cent mortality due to spray.
1. Lead arsenate, 36 ozs. per 50 gals. water	70·25	53·83
2. Lead arsenate, 18 ozs. per 50 gals. water	62·30	45·88
3. Lead arsenate plus white arsenic	60·67	44·25
4. Lead arsenate plus nicotine sulphate...	57·28	40·86
5. Lead arsenate plus lime sulphur	53·86	37·44
6. Calcium arsenate	45·21	28·79
7. Sodium arsenite	42·29	25·87
8. Check. Unsprayed	16·42	0·00

A normal mortality of 16·42 per cent. occurred on unsprayed trees, due to weather conditions, lack of vitality, or predators. Allowing for this normal mortality, the efficiency due to spraying may be calculated. This gives the lowest possible rating for the sprays, as a number of larvæ are poisoned before they produce any blemish on the apple. Larvæ crawling over sprayed leaves are subject to poisoning,[3] and as 75 per cent. of the eggs are laid on the leaves and twigs a number are probably so poisoned. The relative values of the sprays employed and their minimum efficiencies may be seen by referring to the above table.

Calyx Infestation.

It will be seen by reference to the first table that the percentage of calyx entries was relatively small in the case of the sprayed trees, while in the unsprayed check trees 27·82 per cent. of the fruit was infested through the calyx. By comparison of the percentage of calyx infestation and the total infestation it would appear that the calyx sprayings are more efficient in preventing calyx entries than are the cover sprays in preventing side entries.

Spray Injuries and Deposits.

Severe burning of the foliage resulted from the use of sodium arsenite at the rate of one thirty-second oz. per gallon of water. This was therefore reduced to one forty-eighth oz. per gallon, but the burning was too severe to permit the use of sodium arsenite at this rate on a commercial orchard.

Lead arsenate plus white arsenic produced a very limited burning of the leaves, but the damage was too slight to have any injurious results.

The continued use of the lead arsenate plus lime sulphur, gave a pronounced spray residue which necessitated washing of the fruit. This method would therefore need modification before it could be applied at the rate specified.

Bandaging.

All trees in the experimental plots were bandaged, and the bandages were inspected every three to seven days. The number of larvæ captured in the bandages for each plot is shown in the first table, and it will be noted that there was a considerable reduction in numbers on the sprayed trees as compared with the unsprayed trees.

A total of 2,482 larvæ were destroyed from eighty trees, representing 73·65 per cent. of the estimated number of matured larvæ, viz., 3,370, which had left the fruit. The remainder of the larvæ had pupated on the trees in the rough bark or crevices or had been destroyed by predators.

Another experiment demonstrated that the majority of the larvæ reach the bandages by descending the main limbs. It is, therefore, of the utmost importance to see that no hiding places in rough bark or crevices are overlooked if maximum efficiency is to be obtained in the use of bandages.

Windfall Fruit.

When immature larvæ occur in windfall fruit they remain there until fully fed. Larvæ can mature in fruit less than 1 inch in diameter. During the examination of windfalls 6,884 immature larvæ were destroyed, whereas only 2,482 mature larvæ were destroyed in the bandages of the experimental trees.

The importance of the destruction of such infested fruit is, therefore, quite evident, and this method supplements bandaging.

The Packing Shed.

Numbers of larvæ leave the fruit in the packing shed and spin cocoons in crevices, cases, &c., and over-winter in such positions. Over 700 moths from over-wintering larvæ were trapped in the shed during the past season, and this emphasises the necessity of destroying all larvæ in the shed and cases in the autumn. Otherwise the shed should be rendered moth proof, or else no infested fruit whatever should be carried into the shed. The same careful destruction of larvæ should also be carried out in the sheds during the summer months.

All fruit may be sorted in the field and only sound fruit placed in cases and carted to the shed. All infested fruit may be placed in bags and destroyed by boiling or burning.

Summary.

During the past few seasons some doubt has been expressed as to the efficacy of lead arsenate in controlling codling moth. Poor control was attributed previously to faulty timing of the sprays or lack of thoroughness in their application. No increase in efficiency was believed to result

from the use of a larger amount of lead arsenate than that normally recommended, viz., 18 oz. per 50 gallons of water. These experiments demonstrated that increased efficiency is obtained by doubling the amount of arsenate.

The calyx sprays are more effective in preventing calyx infectation than are the cover sprays in preventing side infestation.

It is indicated by comparison of the results from the unsprayed plot and the plot sprayed with lead arsenate, 18 oz. per 50 gallons of water, that—

(*a*) 27·82 per cent. of the fruit is normally infested through the calyx cup.

(*b*) 26·23 per cent. of the fruit is saved from calyx infestation by two calyx sprays.

(*c*) 64·23 per cent. of the fruit is normally infested through the side.

(*d*) 23·83 per cent. of the fruit is saved from side infestation by four cover sprays.

Severe burning resulted from the use of sodium arsenite at the rate of one forty-eighth oz. per gallon of water.

A pronounced spray deposit followed the use of lime sulphur, combined with the normal lead arsenate.

During the season 10,254 larvæ were recorded on the eighty trees in the experimental plots. Of these 2,482 were killed in the bandages, and these represent 73·65 per cent. of the larvæ which had left the fruit.

In the examination of windfall and infested fruit 6,884 immature larvæ were destroyed, thus indicating the importance of this practice.

Infested fruit should not be carted into the packing shed unless adequate precautions are taken to prevent the escape of moths developing from larvæ so introduced.

Spraying with lead arsenate, together with bandaging and the destruction of windfall fruit, are therefore strongly recommended.

LITERATURE CITED.

[1] Oliff, A. The Codling Moth. *Agr. Gaz. of N.S.W*, 1 pp. 3-10. 1890.

[2] Slingerland, M. V. The Codling Moth. Cornell Univ. Agric. Experiment Station, Bull. 142, 1898.

[3] Smith, R. H. The Efficacy of Lead Arsenate in Controlling Codling Moth. Hilgardia Cal. Agr. Exp. Sta. 1-17 p. 436, May, 1926.

THE VALUE OF A PEDIGREE.

A PEDIGREE is only a guarantee of " blood " lines, and the fact must not be lost sight of that it does not do away with the need of selection, particularly where line-breeding is being practised, because the bad qualities, as well as the good ones, can be intensified by line breeding, and it is only by the most strict selection that this can be avoided.—W. J. SPAFFORD in the South Australian *Journal of Agriculture.*

Co-operative Fruit Packing Houses.

Their Requirements and Problems.

R. J. BENTON and W. H. BROWN.

THAT there is a deep-seated conviction in the minds of fruit-growers that the solution of many of their problems lies in the direction of co-operation, is surely proved by the persistence with which proposals for united effort come forward from time to time. In some cases those ideas get no further than general expressions of thought and desire, in others they actually materialise into going concerns. Unfortunately even then the vicissitudes of the cause of combined effort are not over, for a proportion of these projects come to nought. How strong is the conviction that the principle of combination is a sound one is shown by the way in which growers continue to contemplate new movements or the revival of the old ones.

In view of the possibility of certain localities establishing co-operative packing houses in the near future, it is timely to point to a few of the factors that make for success, and also to some of the pitfalls that strew the pathway of such institutions. The subjects that might be dealt with under these headings are numerous, and probably no two people would draw up a similar list—certainly no two people would place them in the same order—but several that experience in New South Wales has brought rather prominently forward may be mentioned, viz., insufficient capital, the supply of indifferent fruit, unsuitable sites and designs, insufficient labour-saving equipment, disloyalty on the part of shareholders, lack of appreciation of the value of a "commercial pack," indifferent management, &c.

Some Causes of Failure in Co-operative Sheds.

The need for sufficient capital to start such an enterprise should be obvious, but several sheds that otherwise might have been reasonably successful really came to grief on this account. Organisation at the growers' end is essential to an improvement in the general position of the industry, and as no one else will do this for them, the growers must make up their minds that they have got to take it up as their own job and provide the capital for the purpose. The number of sheds which have been started with sufficient capital are few indeed, and even some of the larger and more progressive concerns have been seriously hampered in the first few years of their history, though by imposing levies in certain cases and retaining a small excess on packing charges in others, the capital position has been gradually improved. Some of the sheds that have managed to keep going under these conditions have been much handicapped by insufficient equipment or accommodation, which, of course, means increased costs of operation, with the result that in the minds of non-members (and even indifferent members) packing charges compare unfavourably with those incurred privately. A little extra effort on the part of the promoters at the initial stages would save trouble, loss, dissatisfaction, and disloyalty.

The quality of the fruit received at the packing house is a preliminary consideration in connection with every consignment. It, no doubt, appears to be of trivial importance in relation to the success of a shed, but experience shows it to be a real factor. Uniformity in quality contributes to ease and economy in handling, and means that the product of a shed quickly acquires a standarised value on the market. Very large fruit does not command the best price on the market, and undersized and otherwise inferior fruit is even more difficult to place profitably. In addition to being costly to handle at every stage, it is only saleable at a very low rate, and it depresses the value on the market of good commercial sizes. Some sheds decline to handle very low grade gruit, or prefer to turn it over to by-products factories, a class of concern that is handling increasing quantities of fruit to the advantage of the grower, and also—be it said—of the consumer. "Last month the poor stuff delivered at the shed only realised enough to cover the expenses of handling or little more," said one director of the Gosford packing house last season, and he added that the shed "should only be asked to handle good fruit. Poor quality fruit does not justify the expense of proper packing."

It was one of the troubles of some of the smaller sheds that closed down a few years ago that the growers imagined they could themselves market their good fruit to better advantage, but expected the shed to obtain for the small and inferior stuff what they could not get for it any other way. It is no small tribute to the value of good packing that the packing houses are often able to make quite a respectable return to the growers of fruit which otherwise would bring only a few pence a case. At the same time this is not the class of product on which shed labours can be most profitably employed, and regular patrons eventually learn that it pays them to market their highest grade fruit through the co-operative shed, and to place the inferior parcels to best advantage without expending too much time or labour on them. From the shed's point of view, too, it does not pay to receive a number of small lots—fair-sized parcels of fruit of uniform quality are those which make the most profit for all parties concerned.

The Design and Lay-out of an Economical Shed.

The packing house must be well designed and properly equipped. No standard type has yet been evolved—may never be, for local conditions must govern everything—but proper planning so as to avoid needless labour and reduce handling to a minimum is essential to success. Insufficient machinery and poor arrangement of what is procured may hopelessly overweight a shed from the very beginning. Some of the ventures of a few years ago that came to nought were really wrecked on this rock, and other sheds still in operation have had to make alterations at much expense that could have been avoided. Some of the factors that have militated against the success of certain sheds may be detailed as follows:—

1. Design and size of the building unsuitable.
2. Insufficient room for storage of fruit.
3. Lack of labour-saving plant.

The Grading Belt.

The Main Floor, with Sizers and Bins.

THE GOSFORD PACKING SHED.

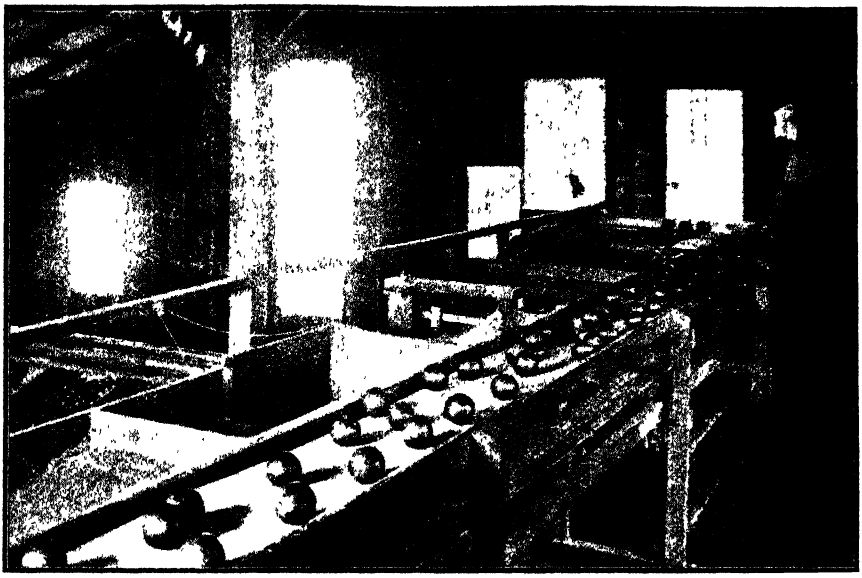
Growers who have been packing for themselves in a bit of a shelter—perhaps at night, and with the help of the family—and forwarding practically everything to market—good, bad, or indifferent—may find it difficult to realise the factors named will really influence the success of a big shed, but experience quickly brings to light that a commercial shed has to be organised on commercial lines. Trained and systematised labour engaged in the production of a standardised article has to be paid high wages in these days, and every facility that cuts out an operation or in any way reduces work is worth while. Concentration on one job by each man must be cultivated, for it makes for greater efficiency and economy.

It is essential to economy that the packing house be erected on the principle of a "straight run" for the fruit, *i.e.*, the fruit should be received from the grower at one end, and should move along through each operation till it emerges ready for marketing at the other end. This is the ideal shed, of course, but in actual practice all sheds do not work on a straight line from one end to the other; some operate rather like a magnified letter L and others more like a magnified U, the consignments being received at one point of the letter, following a steady course round the shed, and issuing at the other point of the letter. To achieve this it is obvious that the shed must be erected as a complete unit, being systematically arranged from the start. It is well in the initial stages to provide sufficient floor space to permit of additional plant being introduced later on without serious disturbance, but that need not interfere with a complete and efficient lay-out at the very beginning. The promoters of the shed at Batlow, for instance, looked a long way ahead, and provided a very large area—a foresight that has already been justified by the convenience with which additional plant was introduced a couple of years after the commencement of operations.

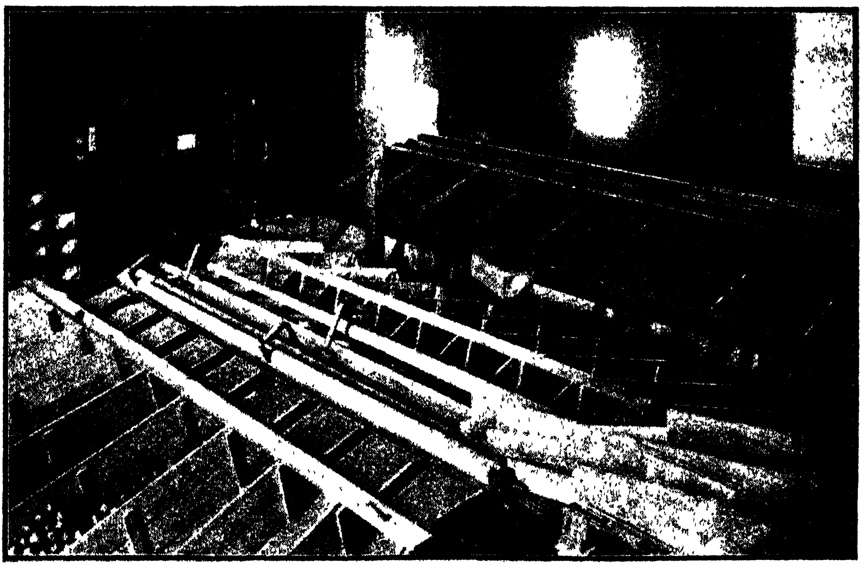
It has been found well to have the floor of the shed about 4 feet above ground level. This enables fruit to be unloaded from growers' lorries or carts without lifting, and similarly allows the packed cases to be loaded out with the minimum of labour. A basement several feet deep may be excavated, and the depth of this, added to the height of the floor above the ground level, will afford very necessary space for the storage of empty cases and case material in which the fruit is to be marketed. Large numbers of cases must necessarily be kept on hand ready for use, and without ample room for them in some out-of-the-way place their stacking becomes a serious problem.

A number of sheds have been constructed on two floors, the upper one being used for the reception of fruit from growers, and the force of gravity being employed for the movement of the fruit through some of the stages, while the lower floor is used for stacking and despatching the packed cases. In such cases the basement under the higher portion of the shed may be employed for storing the stock of empty boxes. Where a new building is being erected, however, it is recommended that the floor be on one level.

In deciding upon the total floor space to be afforded, regard must be had not only for the quantity of fruit likely to be handled, but for the different stacks that may be required for the varieties and qualities that may be



The Grading Belt.



Main Floor, with Sizers and Bins.

THE WYONG SHED.

expected. If stacks of cases or boxes have to be moved continually to make room for incoming fruit or for further varieties and grades, labour costs are incurred in unproductive work. The interest on a little additional space is a small item compared with the wages that insufficient accommodation may involve.

Then the number of varieties grown in the district may be large, and the quality of the product may be variable, especially if much blemished or diseased fruit is sometimes produced, and these are things that it may be found later on should have been taken into account in preparing the plans.

Plenty of space at the receiving end also enables sufficient fruit to be loaded in to keep the shed going for a few days, even if bad weather delays further carting from the orchards, while ample space at the delivery end often means that it is possible to truck large consignments, and thereby save freight.

Expenditure on either buildings or plant should not be on a lavish scale, but there is a minimum below which it is not economical to go, and where possible the plant should be of standardised parts to enable replacements to be made easily.

The Minimum Internal Equipment.

Most growers are now aware of the various operations conducted in a packing shed of the kind we are at present discussing. The essential plant consists, briefly, of (1) a sorting belt, which should be up to 12 inches wide, and long enough to enable sufficient persons to be employed grading the most mixed sample likely to be received; (2) a double-sizing machine; (3) a "nailing-down" press; (4) a machine for wiring cases; (5) an engine of about 3 h.p. or electric power to drive the sorting belt and sizer. In addition, there must be a bin into which the fruit can be tipped to be fed out on the sorting belt, packing benches or stands, lengths of roller conveyors if the turnover of the shed is likely to be large, adjustable clamp trucks for wheeling five or six cases at a time, and, perhaps, an elevator to lift the fruit from the lower end of the feed-bin to the grading belt, whence the fruit may gravitate into the sizer.

For apples and pears one double-sided sizing machine may be sufficient, but for citrus fruits, with their larger range of qualities, two double-sizing machines may be desirable, so that a complete clean-up of one variety of fruit may be effected at one time.

Automatic weighing machines may be installed, if desired, to check the weight of the fruit; these should be placed between the sorting belt and the sizing machine. A brushing and washing machine may be deemed necessary in a citrus shed, and should be accommodated between the feeding bin and the grading belt.

A packing house arranged on these lines would reduce each person's work to the minimum, and each would be dependent on others to be kept uniformly engaged, so that little supervision would be necessary to keep everything working smoothly. One or two points remain to be discussed, however.

The Grading and Sizing Plant.

Plenty of light over the sorting table or grading belt is very important, so that blemishes may be quickly detected. Where a large proportion of the crop consists of good, clean, first quality fruit, grading involves but little labour, only 15 to 20 per cent., perhaps, requiring to be diverted from the table. With such fruit one person can grade fast enough to keep three or four packing, but where a large proportion of second quality or lower grade has to be sorted out, four or five persons may be required on the grading belt to keep even two or three packers going.

When the proportion of high quality fruit is large—approaching, say, 70 per cent. or more over the whole crop—it is most economical to arrange for the sorting belt to deliver direct to the sizer, but where the proportion of good quality is equally mixed with lower grades, it is advisable to arrange the sorting belt so that each specimen has to be handled and placed in its respective class, in order that the likelihood of inferior fruit being missed may be minimised. The handling of medium grade fruit is best allotted to about four operators: the first to take out the lowest grade, the second the third grade, the third operator to take out the second quality, and the fourth to remove all first quality. In case any lower grades should be missed, it is well to have a "return belt," along which fruit can be returned and carried past the graders again.

The machine for the sizing of the fruit should be capable of easily handling the anticipated maximum daily output. Various machines are on the market which are fairly accurate in their work, and providing the bins are each large enough to hold several bushels, so that the packer will not have to move his stand too often, they are satisfactory. The bins should be so constructed that their holding capacity can be altered, for sometimes a portion of a district or a season may produce fruit running rather larger or smaller than the average, and it is a convenience to be able to vary the size of the bins accordingly. Generally the bins near the centre should be the largest.

The sizing machine should be a double one, *i.e.*, it should grade two qualities of fruit at the same time, one qaulity being fed and sized on one side and another quality on the other side. Such a machine will size into bins on each side, and will enable a larger number of packers to be employed with convenience and economy.

Packing and Nailing Down.

The actual packing of the fruit is the next operation, and here speed is essential, though it must be combined with neatness, as the price realised will be materially influenced by the appearance of the case when it is opened. Every assistance should be given the packers to attain these two desiderata. The graders must see that only the right quality of fruit is fed to the sizer, and the sizing must be as accurate as possible, so that the number of packs to be found in any bin is as few as possible. With

practically all makes of sizers about two "packs" are usually found in each bin, and it does not seem possible to get below that, but if more than two are easily found in a bin, speedy work, combined with good appearance, is difficult to obtain.

The case stands, or benches on which the packing is done, should be strong and light, and should preferably be fitted with castors to enable them to be moved with a minimum of effort. The paper for lining the boxes, the chalk or pencil for temporary marking of each box, and the wrapping paper (caught with some light spring holder) should all be close at hand, while the supply of empty cases should be kept up to the packers under the benches.

When a box is full it should not be necessary for the packer to move it far. His business is to get on with the packing of the next case, and the full case should therefore be carried away from him by a few lengths of "roller conveyors" to where the nailer is waiting for it. It is a mistake, too, for the case to have to be lowered to the floor and then lifted again. All such movements must be eliminated if the shed is going to be operated economically.

Let it not be forgotten that among the shed charges the item "salaries and wages" is one the unprogressive or particularly thrifty grower is apt to think he can quite well save. Many a supplier has been lost to a co-operative shed because 1s. 3d., or 1s. 4d., or 1s. 5d. per case for packing and marketing looked "altogether too much." That he got value for his money in an improved pack and a better marketed consignment he hardly stops to consider while he looks at that item "shed charges," grown to positively huge proportions in his mind!

Equip the shed well at the outset, and cut out every possible operation, especially operations of a manual character.

The lid of the case is most cheaply and effectively put on by a "nailer," whose time will be fully occupied where four or five packers are engaged. All fruit is packed above the case level, the actual height varying (according to the nature of the container) from half an inch or more where apples are being handled to perhaps 1½ inches with citrus. A nailing down press is very helpful for fixing the lid in position quickly and holding it so while it is being nailed down. A plentiful supply of lids, so arranged that prompt fitting can be effected, together with the nails (all "headed" by means of a "nail stripper") should be close at hand.

After being nailed down, the case may be wire bound to ensure safe transit—in fact, this is essential where the fruit is destined for distant markets. The wiring is accomplished with a specially made wiring machine, and the inconvenience of having to fix the first wire with a right hand movement and the second one with a left hand movement can be eliminated by making a small turntable on which the whole operation can be carried out; with that simple appointment there is no left hand work, the case being merely swung round after the first wire is affixed so that the operator fixes the second wire with the same movement as the first.

The contents should be marked on the case with a rubber stamp or neatly brushed on with a stencil. If the "nailer" is fully occupied these later operations must be done by another person who will then stack the cases temporarily, pending loading for tran-port.

The advantages of being able to load direct from the floor into railway trucks are self-evident. Several successful sheds in this State have sidings, and undoubtedly have reduced their costs accordingly, but that they are not imperative is proved by the fact that some sheds continue to operate that are several miles from a railway line.

Further Problems.

Two further problems confront a packing house. They are (1) the disposal of the boxes in which fruit is delivered by the growers; and (2) the supply of empty cases for the packers. Large numbers of cases are handled daily under both headings, and they occupy a great deal of space unless some system is devised that will prevent it.

As to the grower's delivery boxes, commonly called "lug boxes," it is advisable that a standard delivery box be used. After being emptied into the bin feeding to the sorting belt, the empties can be dropped by a shute through the floor on to roller conveyors on the ground beneath, and carried some distance toward the roadway, where they can be stacked ready for growers to take delivery of them. Alternatively, an elevator and overhead conveyor can be provided that will lift the empties and carry them over the top of teams that are bringing in fruit, and then gravitate them from that high position to the stacking ground beyond.

The most economical method of handling the cases for the packing is to make and store them in the basement, as suggested above, whence they are elevated to the floor and carried on conveyors beneath the packing bins of the sizing machine.

The Cost of such an Equipment.

The cost of a building such as we have been describing will vary a great deal with local and other conditions, but a few figures as to the outlay involved in the plant may be given.

ESTIMATED COST OF EQUIPMENT.

	£	s.	d.
12 inch belt for sorting, drums, shafting, &c.	65	0	0
Engine	35	0	0
Elevator	15	0	0
Return belt for ungraded fruit, with pulleys, &c.	30	0	0
Automatic weighing machine	25	0	0
Roller conveyors ... 15s. per foot.			
Right-angle curves for roller conveyors	8	0	0
Adjustable clamp trucks	8	10	0
Feeder (to prevent jamming of fruit)	8	0	0
Double-sizing machine, with driving pulleys, &c.	£65 to £90		

(*To be continued.*)

Manuring Citrus Trees for Crop and Vigour.

NITROGEN AN IMPORTANT CONSTITUENT.

W. B. STOKES, Orchard Inspector.

THERE is an axiom very often quoted, "The grower's crop is governed by the amount of manure that is used"—light manuring, light crops—heavy manuring, heavy crops. This may not hold good in all instances in fruit-growing, but it is generally accepted in regard to citrus culture.

A belief is gaining ground in some quarters that nitrogen is an important factor in citrus manuring; its value in this regard has been illustrated in a manurial test carried out at Narara. There are six plots in this test, each comprising three rows of lemon trees, which receive manures as follow, twice in each year:—

Plot No. 1.—Superphosphate, 4 lb. per tree.
" " 2.—Sulphate of ammonia, 2 lb. per tree.
" " 3.—Nitrate of soda, 2 lb. 10 oz. per tree.
" " 4.—Sulphate of potash, 2 lb. per tree.
" " 5.—Superphosphate 4 lb., sulphate of ammonia 2 lb., and sulphate of potash 2 lb. per tree.
" " 6.—No manure.

The trees have been under observation particularly since March, 1926, immediately after a severe drought period and after four applications of the above manures had been given. Trees in Plots Nos. 1, 4 and 6, that is, respectively superphosphate, sulphate of potash and no manure, are yellow, stagnant and the crop of fruit is very poor, while Plots Nos. 2 and 3, namely, sulphate of ammonia and nitrate of soda, stand out green and vigorous. These two plots have carried and are carrying good crops of fruit. The trees on Plot No. 5—complete manure—are in good condition and are carrying satisfactory crops of fruit, but the colour, vigour and crop appears to be no better than the sulphate of ammonia or nitrate of soda plots.

In comparing the potash, superphosphate and no manure plots, no material difference is apparent in colour, vigour, or crop, which indicates, in this instance, that superphosphate alone or potash alone have been of little benefit to citrus trees.

This report is not to be regarded as a recommendation, but as a record. As such it indicates that valuable information would accrue if orchardists in various districts would, by trial on a small scale and careful observation, ascertain the manures best suited to their particular district.

ONE weed plant may produce up to one and a half million seeds. How many weeds will appear in your lands next season as the result of the few you have neglected to destroy?

Pumpkins in New South Wales.

J. DOUGLASS, H.D.A., Agricultural Instructor.

PUMPKINS have for a number of years been a very important crop in all the coastal and many of the more favoured districts of New South Wales, because of the large yield of palatable fodder or human food produced per acre. The crop was not well known in this State until the boom in dairying when it was very extensively grown in our oldest districts as a stock fodder. The varieties most largely grown were of the mammoth cattle type. It was soon realised however, that these pumpkins, although large, were usually hollow, coarse fleshed, and bad keepers, and other varieties of more solid flesh and better keeping quality were grown. This change was largely assisted by the increase in population and the growing demand for pumpkin as human food.

The earliest table varieties grown were Turk's Cap, Button, and Ironbark. These held sway for some time, but the pure varieties were lost through cross pollination and "running out" of the types. Later the Crown became popular, and in quite recent years the three cornered or Triangle type. The latter type is fairly well known to everyone, being triangular in shape, with three distinct folds, medium in size, exceptionally deep in the flesh, with a small seed cavity. The flesh is of good quality, and the variety is a good keeper. The Crown variety has several distinct types which are listed under several names, but all types have a crown at the flower end of the fruit. This crown, in the perfect specimen, should be about half the diameter of the base of the pumpkin, and have three prominent divisions. The best type of this variety averages about 20 lb. in weight and is rather rectangular in cross section. The flesh is fairly thick and darker in colour than that of the Triangle. The Crown variety matures slightly earlier than the Triangle, and for this reason is very extensively grown on the Hawkesbury for the early market. The several strains of Crown pumpkin always bring top price on the Sydney market where the dealers demand a type that is easy to cut, but in the northern markets and the coalfields, where the consumers demand a medium size, whole pumpkin, the Triangle brings top price.

No variety has been given as much publicity as the Ironbark, the popular belief being that this was the ideal quality type and good keeper. The Department of Agriculture in Victoria recently offered a reward for a pure strain of this variety, without success.

In New South Wales the Department of Agriculture has realised for a number of years that farmers have been practically unable to obtain pure seed of the different varieties of pumpkins. Recently field experiments and plant breeding work have been started, with the object of improving this

crop. The two varieties that are receiving the most attention are Crown and Triangle. The latter variety, although a good type, is not the heaviest yielder, and work is being done towards improvement in this direction.

Besides pure seed plots, manurial experiments are also being conducted with the object of ascertaining which fertiliser or mixture of fertilisers will give the best results with the pumpkin crop.

An Experiment at Bolwarra, West Maitland.

Practically every farmer in the Bolwarra district grows a fair area of pumpkins. For the season 1924 and 1925 the Government Statistician gave the area of pumpkins and melons in this district as 431 acres. The variety universally grown is the Triangle.

Ironbark Pumpkins at Penrith.

The soil on these Hunter River flats is very deep, rich, alluvial loam, which is very suited to the growing of all vine crops. In recent years it has been noticed that the early crop in this district makes exceptional growth of vine, apparently at the expense of the fruiting quality, for the yields have been noticeably light.

The Department last season conducted manurial trials with Meade Brothers, with the object of improving the yield of this crop. The land had previously been cropped with turnips, the residues of which had been ploughed under in the late winter. The land had been well worked until planting, which was carried out on the 9th September, 1926. The manure

was worked into the soil around the hills in which the seed was planted. The rows were well spaced and rows of maize were planted between with the object of separating the plots.

The crop made good growth and was harvested during March, 1927. It was quite apparent early in the growing period that the manures were having a beneficial effect, as it could be easily seen that the pumpkins on the treated plots were setting much better. At harvest time the difference was most noticeable.

The Pokolbin Experiment.

This experiment was conducted in conjunction with the pure seed plot. The soil was a loam of volcanic origin, and had only recently been cleared of mixed timber. The land was broken up during May, 1926, with a disc

Pumpkin Crop on the Hunter River.
Note the luxuriance of the growth.

plough, and reploughed twice to bring it into good physical condition. Planting took place on 14th September, 1926, under rather dry conditions. It was only in the latter stages of growth that good rains fell and enabled the crop to set and develop. The improved growth due to the fertilisers could be noticed right throughout the growing period, and it was also noticed that the treated plots matured earlier than the untreated ones. The variety grown in this trial was Triangle of a type rather light in the skin but a very good yielder. Selections for pure seed were made, special attention being given to quality, type, yield, and a tendency to darkness in colour in flesh and skin.

The results of these trials cannot be taken as conclusive, but they clearly indicate that pumpkins very readily respond to artificial manuring. At Pokolbin it is generally recognised that manuring pays, but on the rich

Hunter River flats farmers have not realised the value of this practice. At the present price of pumpkins, say £3 per ton, or even at their value as a pig food, the increased yield would pay for all expenses and leave a good margin of profit.

YIELDS of Pumpkin Manurial Trials.

Treatment.	Bolwarra.	Pokolbin.
	t. c. q. lb.	t. c. q. lb.
Basic superphosphate, 384 lb. per acre.	9 18 0 0	10 3 3 9
Superphosphate, 336 lb. per acre.	7 15 0 4	9 13 3 19
M13. 437 lb. per acre ...	7 8 2 22	6 16 3 2
P7, 303 lb. per acre	7 4 0 12	6 8 0 20
P3, 537 lb. per acre	6 9 2 18	8 0 0 25
Blood and bone, 336 lb. per acre.	4 19 2 22	8 2 2 4
No manure	4 15 3 12	4 18 1 22

The fertiliser mixtures were made up as follows: M13, ten parts superphosphate and three parts sulphate of potash; P7, equal parts superphosphate and bonedust; P3, ten parts superphosphate, three parts sulphate of ammonia, and three parts sulphate of potash.

The yields obtained from basic superphosphate were outstanding. During the previous year trials were conducted but were later destroyed by flood. Up till that time, however, it was noticed that the basic superphosphate plot was ahead of the others.

THE MARKETING OF MILK.

THE problem covered by our title is attracting attention in all lands where industrial activity seems to be increasing faster than rural. We say "seems," because, in fact, the two must preserve some relation one to the other, however much changing conditions may appear to upset the traditional balance.

Mr. F. J. Prewett, of the Agricultural Economics Research Institute, University of Oxford, contributes eighty pages to a series on the "Marketing of Farm Produce," the principal objective, of course, being some suggestions on distribution. Control of that end of the business is rapidly drifting into the hands of a few powerful buyers, and he concludes that "organisation must proceed to national dimensions, with distributor and producer either co-operating or armed in opposite camps." Meantime, however, he sees no reason why the urban capitalist should be allowed to control the situation, and his solution is the combination of dairy farmers so that they themselves at least are able to bargain on even terms. "Only by taking the weapon of the 'surplus' out of the hands of the distributor can the organised farmer make sure that he will secure a fair profit on the costs of production."—Published by the *Clarendon Press*, Oxford, from whom comes our copy.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Field Peas—	
French Grey	Principal, H.A. College, Richmond.
Lima	Principal, H.A. College, Richmond.
Potatoes—	
Satisfaction	Hillen and Leckie, "Cherragorang," Taralga.
	J. J. Maloney, jun., Stonequarry-road, Taralga.
	Parsons Bros., Dangarsleigh, Armidale.
Early Manistee	J. Cusack, Stonequarry-road, Taralga.
Factor	R. E. Ball, Stonequarry-road, Taralga.
	K. Bowen, Springside, via Orange.
	Howard Bros., Cottawalla, Crookwell.
Carmen No. 1	Johns Bros., "Strathalbyn," Myrtleville.
Batlow Redsnooth	T. A. Howard, Cottawalla, Crookwell.
	E. M. Herring "Sheen," Batlow.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1927.

Society and Secretary.		Date.
Wentworth (W. B. Crang) ..	July	13, 14
Peak Hill (T. Jackson)	„	26, 27
Tullamore (J. M. Robertson) ..	Aug.	3, 4
Trundle (W. A. Long)	„	9, 10
Cootamundra (Sheep Show) ..	„	10, 11
Condobolin (J. M. Cooney) ..	„	16, 17
Illabo (R. Day)	„	17
Wagga Wagga (F. H. Croaker)..	„	23, 24, 25
Bogan Gate (J. Egan)	„	24
Parkes (L. S. Seaborn)	„	30, 31
Grenfell (P. Mylecharne) ..	„	30, 31
Junee (G. W. Scrivener)	„	30, 31
Lake Cargelligo (J. B. Costello).	„	31
Ungarie (L. C. Adamson) ..	Sept.	2
West Wyalong (A. Andrew) ..	„	6, 7
Manildra (J. Langley) . ..	„	6, 7
Young (T. A. Tester)	„	6, 7, 8
Gunnedah (M C. Tweedie) ..	„	6, 7, 8
Forbes (E. A. Austen) . ..	„	6, 7
Ganmain (C. C Henderson) ..	„	13, 14
Cowra (E. P. Todhunter) ..	„	13, 14
Albury (A. G. Young)	Sept.	13, 14, 15
Barmedman (S. S. Penberthy) ..	„	14
Murrumburrah (W. Worner) ..	„	20, 21
Canowindra (W. E. Frost) ..	„	20, 21
Temora (A. D. Ness) .. .	„	20, 21, 22
Boorowa (W. Thompson) ..	„	22, 23
Barellan (W. Colville)	„	28
Hillston (J. Peevers) . ..	„	30
Ardlethan	Oct.	5
Quandialla (V. Talbot) ..	„	5
Hay (G. C. McCracken)	„	5, 6
Narrandera (M. F. Murray) ..	„	11, 12
Ariah Park (M. Collings)	„	12
Bribbaree (J. Austin) .. .	„	12
Deniliquin (P. Fagan)	„	18, 19
Griffith (W. Sellin) ..	„	18, 19
Cootamundra (Annual) (W. W. Brunton)	„	25, 26
Lismore (H. Pritchard) .. .	Nov.	16, 17, 18
Albion Park (H. R. Hobart) ..	Dec.	31, Jan. 2

1928.

Society and Secretary.		Date.
Dapto (E. G. Coghlin)	Jan.	13, 14
Cessnock (D. B. McGilvary) ..	Feb.	16, 17, 18
Newcastle (E. J. Dann)	Feb.	21 to 25.
Armidale (A. McArthur).. ..	Mar.	13 to 16

Tubercle-free Herds.

Of the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner.	Address.	Breed.	Number tested.	Expiry date of this certification.
William Thompson Masonic Schools.	Baulkham Hills ...	......	33	15 July, 1927.
Department of Education ...	Gosford Farm Homes	......	32	16 July, 1927.
H. W. Burton Bradley ...	Sherwood Farm, Moorland.	Jersey..	71	21 July, 1927.
Department of Education ...	Mittagong Farm Homes.	......	33	7 July, 1927.
Hygienic Dairy Company ...	Glenfield Farm, Casula, Liverpool.	.....	113	15 Aug., 1927.
New England Girls' Grammar School.	Armidale	.. ..	11	15 Oct., 1927.
Lunacy Department ...	Morisset Mental Hospital.	......	16	18 Oct., 1927.
Department of Education ...	May Villa Homes ...	......	6	3 Nov., 1927.
Do do ..	Eastwood Home	......	10	3 Nov., 1927.
Do do ...	Hurlstone Agricultural High School.	......	47	4 Nov., 1927.
Lunacy Department ...	Rydalmere Mental Hospital.	......	61	23 Nov., 1927.
A. E. Collins.	Hazelhurst Dairy, Bowral.	......	10	6 Dec., 1927.
Miss Brennan	Arrankamp, Bowral	......	27	7 Dec., 1927.
Lunacy Department ...	Callan Park Mental Hospital.	......	26	15 Dec., 1927.
Department of Education .	Yanco Agricultural High School.	......	26	12 Jan., 1928
A. V. Chaffey	"Lilydale," Glen Innes.	.... ..	15.	25 Jan., 1928.
Lunacy Department ...	Kenmore Mental Hospital.	.... .	99	1 Feb., 1928.
Walaroi College	Orange	......	2	3 Feb., 1928
Lunacy Department ...	Orange Mental Hospital.	......	3	7 Feb., 1928.
Australian Missionary College.	Cooranbong	.. ...	51	11 Feb., 1927.
E. P. Perry	Nundorah, Parkville	Guerns'y	30	8 June, 1928.
Walter Burke	Bellefaire Stud Farm, Appin.	Jersey..	37	11 June, 1928.

—Max Henry, Chief Veterinary Surgeon.

The co-operative system brings order out of chaos in the business of the rural community; the co-operative spirit humanises its life. It must, therefore, be borne in mind that, in working out our formula, *Better Business* will be the foundation of *Better Farming* for one reason, and of *Better Living* for another.

Poultry Notes.

July.

JAMES HADLINGTON, Poultry Expert.

The Quality of Eggs and their Distribution.*

In notes which were prepared for a lecture on "Marketing Poultry Products," and published in the *Agricultural Gazette* last month, the factors influencing the quality of an egg were incidentally touched upon as one of the vital points in the marketing of eggs. The publication of those notes has led to a request that the subject should be further discussed.

It will be well for us first to remember the value of eggs as food. In an egg we have all the food constituents necessary for the growth and maintenance of the body. In addition to the flesh-forming and heat-producing substances known as protein and fats, we have quite a large number of mineral salts, such as sodium, potassium, calcium, magnesium, iron, phosphoric acid, silicic acid, sulphuric acid, carbonic acid, and traces of fluorine.

However, we will put the food value of an egg in a form understood by almost everyone, that is, in terms of protein, fat, and minerals. There are no carbohydrates in an egg, their place being taken by the fat content. In this way the analysis of an egg is shown as follows :—

	Water.	Protein.	Fat.	Mineral.	Other Matter
	Per cent.	Per cent.	Per cent.	Per cent	Per cent.
White of Egg ...	85·7	12·6	0·25	0·59	....
Yolk " ...	50·9	16·2	31·75	1·09	0·13

It must not be taken that these two analyses added together will make the total constituents of an egg, because the difference in the volumes of the two parts is so marked. Taking a fresh egg as a whole, the analysis works out as follows :—

	Water.	Ash.	Protein.	Fat.
	Per cent.	Per cent.	Per cent.	Per cent.
Fresh Egg	73·7	1·0	14·8	10·5

The nutritive ratio of an egg is therefore 1 : 1·6. The accepted balanced ration fed to hens has a ratio of 1 to 4·5 or thereabouts. It should not be assumed from this that the ratio of the food fed to laying hens is too wide, because while the hen lays an egg weighing, say, 2 to 2¼ ounces, the food which she eats per day weighs 4 ounces and over and is more much concentrated than the egg, which contains 65·7 per cent. water, while the water content of her food is on an average little, if any, above 12 per cent.

* Notes of an address delivered at the Poultry Farmers' Conference, Hawkesbury Agricultural College, 25th June, 1927.

If we refer to the analysis again in order to obtain some idea of the relative food value of an egg and of beef, weight for weight, in terms of edible parts, we get the comparison as follows:—

	Egg.	Lean Beef.		Egg.	Lean Beef.
Water	73·7	73·0	Fat	10·5	5·5
Protein...	14·8	21·0	Ash	1·0	1·0

In making this comparison we have to take into account the fact that the egg is much more easily digested than is beef, so that our product does not suffer in comparison.

Factors Bearing upon Quality.

The quality of an egg when laid is dependent upon several factors—the hen, her breeding, age, physique, and the class of food fed. Our judgment as to the quality of an egg is determined by the colour and texture of the shell, the colour of the yolk, and the density and colour of the albumen, all these in turn being determined by the factors mentioned above. To begin with, if the hen be of Asiatic origin, or partially so (that is to say, if she is of a composite make-up, such, for example, as the Orpington) she will lay brown eggs or eggs tinted with that colour. If the hen be of purely European origin she will lay white eggs, while even remote crosses may lay one or the other. Hence it is that some alleged Black Orpingtons lay white eggs, while some alleged White Leghorns lay brown or tinted eggs.

Again, Asiatic breeds go broody, while European breeds are supposed to be non-broody. Brown eggs and broodiness go together, and are dominant characteristics. Some of the original breeds, such as Cochins and Brahmas, lay almost chocolate-coloured eggs dotted over with spots resembling iron, while many of the more modern breeds and make-ups lay eggs with shells of much lighter tint, as, for example, Orpingtons and Langshans. The colour of the yolk is also to some extent influenced by stronger or weaker pigmentation as a breed factor. We should therefore expect higher coloured yolks in the eggs of those breeds which lay brown eggs.

But the main factor in yolk colour is the class of food fed to the hens. Hens fed solely on wheat, or wheat products, will lay eggs with very pale yolks, while hens fed largely on yellow maize will, other things being equal, lay eggs with the richest coloured yolks. Green feed, too, plays a part in the colour of the yolks. Age and general health are further factors, and both colour and quality of shell, as well as density of albumen and quality of egg generally, are dependent upon all the factors enumerated.

Aged hens and hens of poor physique mostly lay poor-quality eggs, although in the case of aged hens, if they lay few in number the quality is often better maintained than with their more prolific sisters. The same things applies to the abnormal layer, the eggs of which may have been all that could be desired in the early stages of their laying, but there is frequently a marked falling off in quality on all points towards the close of their laying period. The hatchability of eggs from such hens, too, is usually low—so much so that we are often disappointed at the close of the hatching season (and more so when the chickens are reared) to find so few birds carrying their pedigree mark. The

fact is, the eggs have been laid too fast to constitute such birds good breeding stock from any other point of view than that they have been good layers, and even this quality in an abnormal layer is rarely reproduced.

Then again, both quality and quantity depend very largely upon nutrition, because, as will be readily understood, the making of eggs (not only for their creation, but also for their subsequent nourishment to fruition) depends largely upon the supply of rich vitalising blood to the oocytes (rudimentary yolks). This being the case, we can readily see that to expect good eggs in large quan tities from under-developed and under-nourished hens is to deceive oneself.

Practically all that has been said in respect of the quality of an egg when laid applies equally to size of egg. It takes good birds to maintain size. This factor has assumed more importance recently owing to the issue of the Commonwealth regulations on grading for export, because these regulations are almost certain to react on grading for local consumption, and hens which lay undersized eggs will tend to become unprofitable units in the flock.

Blood Spots and other Abnormalities.

Everyone who eats eggs is familiar with blood spots, and it might be said that much more repugnance is often manifested towards eggs in which a blood spot appears than is perhaps warranted by the circumstances. A simple blood spot in an egg is the result of a rupture of a small blood vessel. But there are two classes of blood spots, one appearing on the yolk, the other in the albumen. Now these blood spots have each a distinct origin. The one appearing on the yolk has its origin in the ova cluster, while that appearing in the albumen is due to a similar class of leakage in the oviduct. Although it is rare, there may be disease of those organs, but there is quite a distinction between the blood spot of pure origin and that of disease, the former being clear red blood. while the latter is usually associated with more or less matter having a diseased appearance. This is how the difference is to be distinguished, and it might be said that, while one does not care to eat an egg containing even a simple blood spot it is quite all right to use it in pastry, nor do such eggs putrefy as readily as might be expected.

It is here that the greatest advantage accrues from what is known as "candling," (that is, testing by light), because when an egg is held up before a light that is properly shaded in a box, and in a darkened room, these blood spots are very easily detected. Blood spots in eggs are not nearly so plentiful as is sometimes made out. As a matter of fact, such eggs are rare—probably less than one-half per cent.

Misshapen eggs for the most part are caused by some defect, constitutional or acquired. The main cause is some abnormality between the longitudinal and perpendicular layers of fibrous tissue in the structure of the oviduct, causing uneven contraction.

Can a new laid egg be bad? This is a query sometimes put to me as a result of a complaint received by persons supplying fresh eggs to a customer. The reply is, "Yes—it is a possibility." It is a rare occurrence, but the cause is simple. An egg that has been held in the oviduct from any cause whatsoever

if held sufficiently long will go bad, and more particularly so if it be a fertile egg. Quite a number of such eggs will have partially developed embryos.

Eggs with soft, thin, or porous shells are quite common. This may be due to a variety of causes. Lack of suitable shell grit is, of course, an outstanding cause. But there are other factors, such, for instance, as a derangement of the functions of secretion, because good shell-making is dependent upon the healthy functioning of the shell-secreting glands. Lack of nutrition or exhaustion are mostly responsible. I have seen good strong hens continue to lay quite a time after all shell-making material in the yard has disappeared. Such hens evidently draw on their own bodies for mineral matter, but it is not long before feather eating and even cannibalism manifest themselves in the flock, and the trouble ends in a general break up.

Factors in Handling Eggs.

Having dealt with matters affecting the production of good eggs, we may now review the factors affecting the quality of eggs after they are laid, and during the processes of handling and distribution to customers. Let us not forget that this is just as vital to the interests of poultry-farmers as is the production of first quality eggs, because eggs do not long remain in that condition unless taken care of, and this is where we have to admit that there is great room for improvement, first on the farm and then in the store.

First of all, then, every care should be taken to keep eggs clean, because the first item on the way to deterioration may be dirt on the eggs, which necessitates washing. Dirt is not always avoidable, but much can be done to prevent the condition, and as a matter of fact on up-to-date farms there are now less than formerly. Then again, when the necessity for washing does arise there are clean and dirty methods of doing so, but—worse still—some dirty eggs are never washed. Needless to say, eggs should never be washed if it can be avoided. However, when it becomes necessary, the eggs should only be immersed in water to loosen the dirt, plenty of clean water should be used, and the eggs should not remain in it one moment longer than is necessary.

It is worthy of mention that a pinch of caustic soda to each gallon of water will assist in loosening the dirt and act as a germicide. When this method is adopted the eggs should afterwards be rinsed in clean water.

The practice of gathering eggs twice a day is commendable, both in respect of keeping the eggs clean and also of preventing breakages. It pays to gather twice daily, even on the latter score.

The Keeping of Eggs.

Eggs should not be exposed to the sun, and cleanliness should be the rule in the egg room. This room should be sweet, clean, and well ventilated, but the eggs should not be exposed to either high temperatures or to draughts.

It should be remembered that the amount of shrinkage of the air cell situated at the large end of the egg is the measure of staleness, and that draughts will largely accelerate the rate of shrinkage. In hot weather there is difficulty in keeping down the temperature of the ordinary egg room on the

farm, but much can be done by packing the eggs away. If, for instance, the eggs are packed into the cases in the cool of the morning and the cases are packed close together and covered over, they will be kept several degrees cooler than if left lying about in bins or receptacles.

The collection of eggs by lorry from the farm and travelling in the heat of the sun is another way in which eggs are sometimes exposed to high temperatures. Cases of eggs standing about railway stations and sidings is attended with the same danger. All such exposure leads to deterioration.

When the eggs arrive on the agents' floors, the care of the eggs is also, as a rule, less studied than it should be. Not infrequently eggs lie about for a week or more during the plentiful season, which is also the hot period of the year, further deterioration being the result. All this time the eggs are being sold as "new laid."

These eggs pass through still further vicissitudes before they reach the table of the consumer, for it is perhaps a week after receipt of the eggs before they are cleared out of the grocer's store. The last stage they pass through is in the hands of the housewife, who perhaps keeps them for a few days in a place not too cool before they are eaten. Is there any wonder we hear complaints about stale eggs for which cold storage or something else is blamed?

The Remedy.

We are all familiar with the railing that goes on against cold-stored eggs, but I believe that when we have evolved a proper system of handling eggs it will be something on this basis:—The eggs will be gathered on the farm twice per day, will be carefully handled in all respects as indicated above, and will receive more care in transit and on agents' floors. Next—and I desire to emphasize this point—they will be repacked into odourless fillers and flats and properly tested and graded during the repacking, as is done for export. Then all eggs not sold within forty-eight hours will be run into chilling chambers, the temperature of which will not exceed 45 deg. Fah., and if they are to be kept any length of time the temperature will be not more than 33 deg. Fah.

When such a method of handling and holding eggs has been evolved—and not until then—we shall be able to guarantee first quality eggs to consumers.

In putting forward these expectations I am not overlooking the prevailing prejudice against cold storage, but my experiences, together with experiments which have been carried out, have satisfied me that the above changes in our handling methods are what is wanted. The sooner they are brought into operation the better.

When the procedure outlined has come about, we will be quite surprised that anyone ever questioned the quality of properly cold-stored eggs and wanted them branded, Cold storage properly conducted, with eggs properly handled, will do for the poultry industry and for the housewife what it is doing for the dairyman and consumers of butter. Further, if the regulations are put into force which were asked for at the Bathurst Conference there is only one way to prevent half our eggs going to the inferior grade, and that is chilling. When all this comes to pass both producer and consumer will

look upon cold storage as a friend, and not as an enemy. If our eggs were handled in this way from farmer to consumer, the consumption of eggs during five or six months of the year would be nearly doubled because of the improved quality and more even prices that would rule. There would then be little need for export, with its attendant losses, or at any rate export would be on a smaller scale.

Someone will say—" Yes, but the speculator in cold storing will reap the benefit." Well, if he does, it will be due to the lack of effective organisation among poultry farmers.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 31st March, 1927:—

Description.	Imports.	Exports.
Interstate.		
	Cases	Cases.
Fresh Fruits ...	630,378	60,355
,, Tomatoes..	3.410	...
	doz.	
,, Melons ...	6	...
	lb.	lb.
Canned Fruits ..	44,268	1,680
Dried Fruits—		
Unspecified ..	13,104	1,512
Currants	12,320	1,008
Raisins ..	11,480	672
Apricots ..	4,536	224
Apples ...	6,244	224
Peaches ..	8,820	...
Pears	1,484	..
Prunes ...	3,388	504

Description.	Country of Origin.	Imports.	Exports
Oversea.			
Fresh Fruits—		Centals.	Centals.
Citrus	....	6,323	1,617
Apples ..	....	..	458
Bananas ...	....	1,452	...
Pears	....	...	350
Pineapples ...	....	4	557
Other	....	399	2,466
Dried Fruits—		lb.	lb.
Apples, Pears, Peaches, etc	U.S.A.	144	...
Apples ...	....	...	540
Apricots ...	....	...	932
Currants	....	...	29,816
Prunes ...	U.S.A.	152,135	481
,, ...	Smyrna	1,120	...
Peaches ...	....	...	512
Raisins—			
Sultanas ...	....	.	2,380
Other ..	Spain	750	1,397
	United Kingdom	160	..
Dates	France	81	14,589
	Mesopotamia ..	147,618	...
Other	....	...	1,155
	Belgium ..	164	...
	China	3,766	...
	France	316	...
	Greece	1,200	..
	Smyrna... ...	2,560	...
	Spain	2,140	..
	Sweden... ...	400	...
	Syria	214	..
	Turkey ...	11,236	...
	United Kingdom	88	.
	U.S.A .	2,680	...
Preserved in liquid—			
Apricots ...	....	...	67,085
Peaches ...	....	...	118,587
Pears ..	....	...	2,278
Pineapples ...	....	...	784
Raspberries	....	..	1,776
Other ...	... .	...	18,240

Orchard Notes.

JULY.

W. J. ALLEN and W. LE GAY BRERETON.

Ploughing.

THE advantages of early ploughing have frequently been mentioned in these notes, and there is no need to repeat them here, except to urge that every endeavour should be made to complete the work early this month.

Pruning.

With the exception of some of the early blossoming peaches and Japanese plums, chiefly grown in the coastal districts, pruning of deciduous trees can be continued till well into next month. At the same time the work should be pressed on with for the reasons given in last month's notes.

It would be wise NOT to burn the prunings from apple trees that are carrying parasitised woolly aphis, but to stack them in some place out of the way, yet close to beds of aphis-liable apple trees, where the *Aphelinus mali* parasite is not so well established.

Pests and Diseases.

With the exception of some of the very early blossoming varieties of peaches such as Bell's November (which should be sprayed earlier), it is a good time now to apply winter-strength lime-sulphur, or 6–4–40 Bordeaux mixture. The application should be thoroughly done, care being taken that the spray reaches out to the ends of the finest laterals. It is quite easy to spend too much time and spray on a tree and yet miss the essential parts.

If black peach aphis are showing on the trees, which sometimes happens in the winter months, and which is a sign that the outbreak on those trees will be severe in the spring—tobacco wash or nicotine sulphate should be added to the curl leaf spray. The right proportion of each ingredient in such a combined spray must be carefully maintained. If preferred the trees can receive an additional application of miscible spray oil when the buds are well swollen in the spring instead of the combined spray in the winter.

San Jose Scale.—It is during pruning that the presence of this pest on deciduous trees is often detected, and such trees should be marked for special treatment. If the pest has become at all general through the orchard, all the trees should receive a thorough application of winter strength spray oi or lime-sulphur. If lime-sulphur is depended on, the application should be delayed till as late as possible when the buds are well swollen and just about to shoot, and it is essential that the concentrated lime-sulphur solution be of high quality and correctly diluted to the full winter strength. As a rule this Department has found the spray oil more satisfactory for the control of this pest than lime-sulphur.

Woolly Aphis.—Where the parasite *Aphelinus mali* has been active during the latter part of the previous summer and autumn, and the trees are fairly well cleaned of woolly aphis and are showing a good percentage of parasitised aphis it would be advisable NOT to apply the clean-up winter spray generally, but to confine it only to such trees as are badly infested with woolly aphis and on which parasitised aphis are hard to find. Those who have not attempted, and those who have failed to establish this parasite amongs their aphis-infested apple trees should make arrangements to obtain parasitised aphis either from other growers in the neighbourhood or from the Department of Agriculture. It should not be forgotten that in many of our dry hot inland districts woolly aphis does not thrive in normal summers, and few precautions against it are necessary.

Green Peach Aphis and Black Cherry Aphis.—It is too early yet to make the precautionary applications of oil sprays against these pests, but growers should be prepared to do so when the buds are swelling and just before they burst.

Codling Moth.—It should not be forgotten that before spring the loose bark on apple or pear trees should be removed and all sheltering moth larvæ killed

Leaflets.—Free publications on all the abovementioned diseases and pests and their control are obtainable free on application to the Under Secretary, Department of Agriculture, Sydney.

MILK RECORDS AND THE BREEDING OF DAIRY CATTLE.

IN the breeding of pedigree cattle, breed character must remain one of the primary considerations, and in the breeding of all dairy cattle, form, stamina, and constitution cannot be ignored. It happens with all breeds that some of the heaviest milkers are in themselves moderate animals judged by every standard except milk production, and it may be claimed that in the dairy herd, milk production is almost the only thing that matters. Prolonged and persistent milk production is, however, largely a matter of stamina, stamina again of conformation, and conformation of consistent breeding to one standard. A blind trust in milk records must lead quickly to degeneracy, and prove a handicap rather than assistance. Because it is the object to breed heavy yielders, it does not follow that the best results will always be obtained from breeding from those with the greatest yields to their credit.—*Farmer and Stockbreeder and Agricultural Gazette.*

HAY is of vital importance to dairy calves. The digestive tract will not develop properly unless hay is supplied early in the calf's life, and the growing heifer should be encouraged to eat a good amount—preferably of lucerne hay.—C. MCGILLIVRAY.

Agricultural Gazette of New South Wales.

Championship Field Maize Competitions.

THE JUDGES' REPORTS.

THE SOUTH COAST.

R. N. MAKIN, Senior Agricultural Instructor.

THE judging of the South Coast section of the Royal Agricultural Society's Field Maize Competition was finalised on 13th June. The spring of 1926, being unfavourable for maize-planting, resulted in some of the late sowings being made in December, and where late varieties were planted, this accounted for late harvesting and consequently delayed judging.

Thirteen entries were judged, viz., six from the Camden group; four from the Nowra group, and three from the Kangaroo Valley group, the scale of points used being as shown hereunder:—

	Maximum Points.
1. Germination or stand	10
2. Cultivation methods and weed control	25
3. General appearance and condition, evenness of crop	10
4. Freedom from disease and insect pests	10
5. Purity and trueness to type	15
6. Estimated yield, 3 points for every 10 bushels	...

The championship was awarded to Mr. H. Cox, of Barrengarry, for a crop which was grown on land formed of sedimentary deposits and which for three years previously had carried crops of sorghum and maize. The ground was ploughed in August to a depth of about 7 inches, subsequently harrowed and twice disced, then again harrowed and rolled prior to sowing. The seed was sown on 7th October by means of the maize planter, the drills being about 3 feet 6 inches apart. No fertiliser was used, but a limited quantity of cow-yard manure was distributed over the ground. The variety grown was a class of smooth Mastodon, or what is known locally as Cox's Yellow; the crop lost points because of variation, but scored well for yield and careful cultivation.

Throughout the districts represented, the maize yields were comparatively light, due to the dry weather conditions which were met with at planting time, and which, except for some rain in December and January, were very dry until April, when heavy rain and wind beat down the crops to the ground. The Camden district suffered more severely than the other districts through the dry months.

Taking a general view of the plots, the most striking feature is the class of maize grown. With the exception of two lots of Hickory King and one of Fitzroy, the quality was very disappointing, and competitors lost many points under the heading of purity and trueness to type; particularly the Numba grower. All growers interested in the production of maize for

grain must give closer attention to this point. Competitors must remember that pumpkins, melons, sorghums, or any plants other than maize, detract from the maize crop. Several lost points on this account under the heading of cultivation methods and weed control.

There were some very outstanding differences in planting methods, chiefly in distance between the rows. For instance, the Numba plot was sown with a distance of 2 feet 7 inches between the rows—the variety being a class of Hickory King—while at Burragorang a plot of Leaming was spaced 4 feet 2 inches. Had both these plots been spaced at 3 feet 6 inches there is little doubt that results would have been better. Although the estimated yield at Numba was the highest for the Nowra group, the quality of the maize was not to be compared to the Terara corn. The stand was good, as far as stems are concerned, but quite a number of stems were found empty, due, no doubt, to the close planting. I consider the Numba grower was unfortunate in having the rows so close. Regarding disease and insects there was no fault to find—with the exception of a little smut.

Considering the season, and the fact that the competitors made no special preparation for the competition, the results were good. There are plenty of good maize-growers to be found on the South Coast, and providing care is taken in the selection of good-class seed, some high yields should be forthcoming next season.

The points awarded each competitor are shown in the following table:—

AWARDS in South Coast Field Maize Competition.

Group and Competitor.	Germination or stand.	Cultural methods and weed control	General appearance and condition, evenness of crop	Freedom from disease and insect pests.	Purity and trueness to type	Estimated yield (3 points for every 10 bushels.)	Total
Kangaroo Valley Group.							
H. Cox, Barrongarry	9	23	9	9	10	24	84
J. Keenan, Barrengarry	9	24	9	9	10	21	82
Williams Bros, Glen Murrary ...	8	15	8	9	12	19½	71½
Nowra Group.							
W. Murray, Terara	9	23	9	9	14	18	82
A. Motram, Numba	9	20	9	8	8	22½	74½
D. V. Boyd, Terara	8	20	8	8	14	17	75
H. J. Motram, Tappitilla	8	20	8	9	9	18	71
Camden Group.							
Camden Park Estate	9	20	8	8	9	15	69
L. W. Biffen, Picton	7	21	8	9	14	9	68
H. Lowe, Camden	6	15	6	9	10	8	54
H. Lowe, Camden	7	15	7	9	12	12	62
Bucholz Bros., Burragorang	5	23	6	7	10	9	60
" "	6	23	6	7	12	12	66

THE NORTHERN TABLELANDS.

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.

Field maize competitions were conducted on the Northern Tablelands this season by the Agricultural Societies at Tenterfield, Glen Innes, Inverell, and Armidale, and judging for the Royal Agricultural Society's Championship took place early in May, the awards being as below.

Glen Innes won by an outstanding majority. Last year Glen Innes did not compete owing to apathy or failure to realise the importance and value of these championship contests, but the district came up well this year with thirteen crops in its local competition, and with a splendid crop for the championship.

Mr. Campbell thoroughly deserved his easy success. He has the reputation of being one of the best maize growers in the district, and the crop, which was of the Wellingrove variety, bred and selected at Glen Innes Experiment Farm, was estimated to yield 75 bushels per acre. The crop was grown on a rich basaltic loam which had been under cultivation for over forty years, and which had previously grown two crops of oaten hay; land ploughed in March after last hay crop; left to lie through the winter till August, when re-ploughed shallow; springtoothed and harrowed and sown during third week in October, being check-rowed by use of chain with double-row drill; three grains at each hill 3 feet 8 inches apart each way; crop harrowed when about 6 inches high, thereafter cultivated three times.

The only weeds present were a harmless growth of wild hibiscus which came up after the third cultivation; bad weeds, such as Bathurst Burr and Boggabri, were entirely absent. The crop scored nearly full points under almost every heading and the seed was of very good type and purity. The yield of 75 bushels was 10 bushels higher than any other crop inspected on the Northern Tablelands, and was a very fine yield indeed, especially when the seasonal conditions are considered, the spring months having been so dry throughout the tableland that few crops germinated until December.

The Cooredulla Estate at Tenterfield entered a nice crop of Leaming, which was estimated to yield 65 bushels. It had easily won the local competition, but lost points in the championship for seed purity and type. This estate had, however, improved on its third place in last year's Northern Tableland championship—a consistent and creditable performance which indicates the good results that can be obtained from maize-growing in the Tenterfield district by good management. It should serve as a healthy inspiration to the majority of maize-growers in this district.

The Armidale district, which secured the first championship cup last year, to some extent declined in prestige in this competition, though Mr. H. S. Short made a material advance from third place in the district last year to first in the local competition and third in the championship this year.

Mr. Short set out specially to increase his points under those headings in which he had previously lost, and his very creditable progress indicates the high educational value of these competitions. He has been a practical maize-grower for many years and is willing to study methods of improvement, and he readily sees that such improvements can not only be made in competition crops but can be put into practical operation over the whole farm.

The Inverell crop, grown by Mr. J. S. Meale, was a good crop under the seasonal conditions in that district, which had suffered more from the dry spring than the cooler parts of the tablelands. Inverell is by no means a back number in maize growing, and it is anticipated that with anything like a reasonable season it will yet surprise the higher tableland areas by showing what are the resources of the district in this crop.

Throughout every district this year the feeling was expressed that these competitions have not only come to stay but that much greater support will be given them by an increasing number of competitors in the future, as a result of a better understanding of their purpose and significance.

DETAILS of points in Northern Tableland Championship Competition.

Competitor.	Maximum points	R. H. Campbell, Glen Innes. (Wellingrove.)	Cooredulla Estate. Tenterfield. (Leaming)	H. S Short, Armidale (Large Goldmine.)	J. S. Meale, Inverell. (White Prairie Queen)
Germination or stand ...	10	9½	10	9	8
Cultivation and weed control	25	23	20½	17	19½
Evenness, appearance, &c. ...	10	9	9	9	8½
Freedom from disease and insect pests	10	9	8	9	8
Trueness to type and purity	15	13	9	13	9
Estimated yield	*	45	39	33	33
Totals	...	108½	95½	90	86

* Three points for every 5 bushels.

NITROGEN FIXATION BY LEGUMES.

WHEN the plant has become established, the bacteria in the soil whose property it is to be parasitic on legume roots, attack them and commence to feed on the plant juices, and being aerobic (*i.e.*, requiring air for growth), use the air taken in by the plant by its roots. This parasitism sets up thickening and overgrowth of the affected part. The bacteria themselves live in a surfeit of food, so much so that they become more and more modified, increasing largely in size until a stage is reached when they are unable to resist the digestive action of the plant juices, and are themselves used as food. The nitrogenous matter which they have themselves manufactured in their bodies becomes free for use in the plant. There is thus a continuous supply of nitrogenous food obtained by the plant.—N. DAVENPORT, in the Western Australian *Journal of Agriculture.*

The Marketing of Primary Products.

SOME NOTES ON THE 1927 ACT.

C. C. CRANE, B.A., Organiser of the Agricultural Bureau.

As a result of the Producers and Consumers' Conference held at Bathurst last September, certain legislation has been enacted by the Parliament of New South Wales, and it is thought that an outline of the provisions of the Marketing of Primary Products Act will be of interest to farmers generally. The Act was assented to by his Excellency the Governor in March of the present year, and became operative in June.

The Act (*a*) provides for the formation of a State Marketing Bureau under the charge of the Director of Marketing, and (*b*) the formation of marketing boards for agricultural produce, if producers of such produce so desire, and (*c*) defines the powers and duties of the Marketing Bureau, the Director of Marketing, and the marketing boards.

The Creation of Marketing Boards.

Marketing boards may be established to market any agricultural produce, wool excepted. A marketing board may be established to market one or more classes of produce, and may cover a given district or the whole State. Each marketing board established will be established for a stated period, and will operate for that period unless dissolved in one or other of the following ways:—

(*a*) On a vote of both Houses of Parliament a board may be dissolved.

(*b*) If it is proved that a board has used any of its funds for any party political purpose, such board may be dissolved and a receiver appointed to carry on till a new board shall have been elected to replace it.

(*c*) In the event of 100 producers (or less in prescribed circumstances) under any board signing a petition asking for the dissolution of that board, the Governor may order a poll of producers to be taken, and if a majority of the votes cast favour dissolution, the board shall be dissolved.

As the first step in the formation of a board, the produce must be proclaimed a commodity under and for the purpose of the Act. Such a proclamation will be made with respect to any class of produce (wool excepted) when a petition signed by not less than 100 producers of that produce asking for the proclamation shall have been presented to the Governor, or, where there are not more than 150 producers concerned, then by one-half of the actual number.

When a product is proclaimed a commodity as above, the proclamation shall—

1. Give not less than fifty days' notice of polling day, on which the producers will decide whether a board is to be established or otherwise. If at least two-thirds of the producers vote, and if more than two-thirds of those who do, vote in the affirmative, then a board shall be proclaimed for that product, and for a stated period.

2. A subsequent proclamation declaring that a board shall be constituted under the Act shall give not less than fifty days' notice of a polling day on which producers will elect their representatives on that board.

Polls may be also taken—(*a*) to fill vacancies on a board, (*b*) to decide whether a commodity is to become vested in a board or not (an emergency provision), (*c*) to decide whether levies may be made for the establishment of insurance funds or for certain particular purposes, and (*d*) to decide whether a board shall be dissolved.

On the question of the constitution of a board, voting shall be compulsory, a penalty not to exceed £2 being prescribed with respect to defaulters. Where a poll is taken and results in a decision not to form a board the Government shall bear the expense, but if a board is formed this expense becomes a charge against its funds, as do the expenses of any other polls that may be taken.

A register of all producers will be prepared annually, grouped in industries. The term "producer," for the purposes of the Act, will include—(*a*) any person on whose behalf a commodity is produced, (*b*) any person producing that commodity, (*c*) the partners to a partnership engaged in such production, (*d*) the partners to a share-farming agreement, and (*e*) the sons of a farmer 18 years and over not in receipt of wages but in receipt of board and pocket expenses.

Provision will be made by regulation for the compilation and revision of rolls of producers entitled to vote at polls and elections and for the determination of the qualifications of voters.

The Personnel of Marketing Boards.

In general the personnel of boards shall consist of three representatives of the producers who will be elected by them, the Director of Marketing, and one representative of the consumers, to be selected by the Governor.

Provision has been made for variation of this composition of the boards in the following ways:—(*a*) From time to time on the recommendation of a board the Governor may direct the election of an additional producers' representative; (*b*) Where two or more products are controlled by one board, or where a new commodity is placed under the control of an existing board, the Governor may make such provision for representation by

election of the producers of each of such commodities as he deems proper, but in any such case a board shall comprise at least five producers' representatives.

In all cases the chairman of a board shall be one of the producers' representatives, and he shall exercise a deliberative and also a casting vote.

The Powers of a Board.

The general powers conferred on these boards provide that a board may acquire such land, buildings, and equipment generally as it may deem necessary. A board shall be a body corporate, and may sue or be sued in its official name. A board may enter into contracts, and do all things necessary and convenient for the purposes of the Act.

Marketing powers conferred on these boards provide that a board shall direct the policy to be adopted in marketing a commodity, and it may sell or arrange for the sale of the commodity, and do all things necessary for that end. It may appoint such specialists, agents, servants, &c., as it may find necessary, may arrange for financial accommodation with the Government of the Commonwealth or any other bank or financial institution approved by the Government, and give necessary securities. As far as practicable, it will be the duty of the board to provide a supply of the commodity in the State, and to make such arrangements as it deems necessary for export.

Compulsory Delivery of a Commodity to the Board.

It is provided under the Act that producers shall deliver all of the commodity to the board or its authorised agents within such times, at such places, and in such manner as the board may require by public or other notice. No person shall sell, or deliver, or buy any of the commodity except as prescribed by the board; the penalty for so doing is not to exceed £100.

The board may (*a*) refuse to accept a commodity if unsatisfactory, in which case the producer may dispose of it as he thinks best; (*b*) grant exemption (1) to small producers, (2) to producers who make direct sales to consumers or retail vendors, (3) with respect to commodity required by producers for feed or for seed for the producers' own use, or (4) for such other purposes as may be prescribed; (*c*) make general or specific exemptions; or (*d*) withdraw any such exemptions.

Delivery of Commodity to a Board.

Produce shall be delivered in the name of the producer, but it may be delivered through a co-operative company in the name of the company. Each consignment shall be accompanied by a certificate of merchantable quality, issued by a State grading officer or other officer appointed in that behalf. A board shall not refuse to accept any of the commodity which is of the prescribed quality, provided it be tendered to the board as prescribed.

Method of Payment.

Payment shall be made to the producer on the basis of the net proceeds of all the produce sold by the board during such periods of time as may be prescribed by the board. Pool periods will be prescribed and the price paid to the producer will be the average net price of the commodity during those periods. The board's decision as to the standard or quality of any produce shall be final. The board's decision as to the method of determining dockage or deductions, cost of freight to shipping point, and other charges shall be final. Once a producer has delivered his produce in the prescribed manner, the board shall assume responsibility.

Certificates.

As soon as possible after receipt of commodity the board shall issue a certificate, but such certificate may be withheld or referred in the event of notification as to liens, mortgages, &c., made to the board. The board may issue separate certificates to the parties of a share-farming agreement. The board may make or arrange for advances on account of a commodity at such times and on such conditions as the board may think fit.

The board may make general levies from time to time and retain such money from proceeds of sales. Such money shall be applied to the (*a*) payment of administrative expenses, including salaries, (*b*) payment of costs of polls, (*c*) payment of advances made to the board for the purposes of the Act, (*d*) establishment of funds for crop insurances, (*e*) for use in co-operation with the Department of Agriculture in instructional and experimental work.

Before any levy is made for the establishment of an insurance fund, due notice of intention must be given, and the prescribed number of producers may petition that a poll be taken to decide whether such levy be imposed. Polls may be taken also if a board proposes to make levies which are to be partial and not general in their application.

The State Marketing Bureau.

The functions of the State Marketing Bureau are to (*a*) prepare rolls of producers grouped in industries, (*b*) take steps to determine and record costs of production, (*c*) keep records of imports, (*d*) keep records of exports, (*e*) keep records of external production as it influences marketing in this State, (*f*) keep records of wholesale prices, retail prices, returns to producers, &c.

The Director of Marketing.

This official shall be responsible for the administration of the Act and of other Acts relating to marketing. He shall publish forecasts of primary production in Australia and New Zealand and in other countries, and shall publish general information as to marketing matters, but his powers are not to be construed as affecting the powers of a marketing board in the discharge of its functions under the Act.

The right to publish by broadcast or otherwise marketing information as official is reserved to the Director of Marketing.

Regulations.

Regulations may be gazetted coming under two headings, namely, (*a*) general regulations, and (*b*) marketing board regulations.

The general regulations will provide for the conduct of elections and polls, compilation and revision of rolls, qualifications of voters (that is, amount to be produced to enable them to vote), settlement of disputed elections, the filling of vacancies, and prescribing the certificates and forms to be used under the Act.

All marketing board regulations shall be as recommended by the board, and shall provide for conduct of meetings, fees and expenses, fixing of conditions of sale, fixing of standards, fixing pool periods, making of general levies, and making of special levies.

Copper Carbonate Prevents Weevil Infestation.

Many advantages are claimed for the dry method of treatment of seed wheat with copper carbonate for the prevention of bunt. Not the least important is that the germinability of the seed is not affected as is the case when the seed wheat is treated by the bluestone and formalin methods that were formerly in general use. It is not, however, known generally that this treatment also prevents weevil infestation.

A test recently conducted by the Department demonstrated that seed treated with copper carbonate powder can be held for twelve months not only without impairing the germination of the seed but also without danger of infestation by weevil. In May, 1926, a bag of seed wheat (treated with 2 oz. of copper carbonate powder to each bushel) and also a bag of untreated seed, were stored in Sydney under conditions favourable to weevil infestation. In order to make the test more severe, treated wheat was placed in the bottom half of another bag and the top half was filled with untreated wheat.

After being stored under these conditions for twelve months, the wheat was examined, and it was found that the treated wheat was free from weevil, while the untreated wheat was heavily infested. Similar results were obtained with the seed in the bag containing both treated and untreated seed. The upper portion of the treated wheat in the bottom half of the bag contained dead weevils, showing that the copper carbonate had killed those weevils which had come from the untreated wheat.

The results of this test prove conclusively the efficiency of copper carbonate in killing weevils and preventing infestation. The germinating capabilities of the treated seed wheat had not been affected by the treatment and storage for twelve months, for a test of the treated seed resulted in a 99 per cent. germination as compared with a 54 per cent. germination of the untreated seed, due to the damage by weevils.

Frequently farmers have a surplus of seed wheat at the completion of sowing, and it is of value to know that seed wheat treated with copper carbonate can be held over till the following season for sowing without danger of reduced germination or of weevil infestation.—H. C. Stening, Chief Instructor of Agriculture.

The Better Farming Train.

ARRANGEMENTS have been made for the first western tour of the Better Farming Train, the dates being as follows:—

8 August ...	... Depart Sydney.	17 August ...	... Dubbo.
9 ...	.. Bathurst.	18 ,,	,,
10 ,,	,,	19 ,,	. Eumungerie.
11 ,,	... Orange.	20 ,,	.. Gilgandra.
12 ,,	,,	21 ,,	.. Coonamble (Sunday).
13 ,,	... Wellington.	22 ,,	,,
14 ,,	,, (Sunday).	23 ,,	,,
15 ,,	,,	24 ,,	... Narromine.
16 ,,	... Geurie.	25 ,,	.. Trangie.

It is pointed out that on this first western tour it is impossible to carry out a more extensive itinerary, but other tours will be arranged in due course. A great number of applications have been received by the Department of Agriculture for the train to visit different centres, and the itinerary is arranged to serve the needs and meet the convenience of as many producers as possible within range of the railway system.

THE JUNIOR FARMERS' CLUB.

THE slow development of the primary industries of the State has for some time caused concern among those closely in touch with rural affairs. Australia is but a young country and the wealth of its soil is the first that should be exploited. Instead, however, we are confronted with very slight advances in the total quantity of primary products and an almost imperceptible increase in rural population. Unfortunately, even the young people brought up on the farms are being attracted away to city avenues of employment, and the first effort to solve the problem must therefore be an endeavour to convince them that rural life is the pleasantest and the most profitable. As to the first of these conditions, ordinary social development is daily removing the disabilities that once attached to farm and station life, but the impression that the occupations of the country are as attractive financially as those of the city can only be achieved by inculcating sound methods of production.

With the view to making a beginning in this direction several organisations are combining in New South Wales to promote the formation of junior clubs for boys and girls in every district with the object of promoting competitions which will cultivate a liking for rural pursuits and arouse interest in their great possibilities. The many characters these competitions can take are obvious—some have already been conducted in this and other countries—but their value in discreet hands cannot be doubted.

To give effect to these proposals funds are required, and an appeal is being made for practical support from those to whom the object appeals. Donations should be forwarded to the Treasurer, Junior Farmers' Club Council of New South Wales, Department of Agriculture, Box 36A., G.P.O., Sydney.

Field Experiments with Cereal Crops.

WAGGA EXPERIMENT FARM, 1926.

N. SHIRLOW, Experimentalist.

JUST before and at seeding time continuous rain prevented the eradication of Cape weed, which grew abundantly. The early sown plants were more fortunate than the late, as they were able in most cases to get ahead of the weeds. The later sown plots in many cases were thin, owing to weeds, mainly Cape. Good rains fell throughout the growing period of the crops. A heavy storm just before harvest caused damage in many wheat plots, especially the taller growing varieties, and completely ruined the grain oat plots. Flag smut showed up in practically every variety except Nabawa; Wandilla was only slightly attacked. Loose smut was present, especially in Zealand, which appears very susceptible. Very little rust showed up and no take-all or bunt.

From April to December, 1,912 points of rain fell: April 413 points, May 163, June 357, July 204, August 199, September 210, October 196, November 42, December 128; total, 1,912 points.

The Land and its Preparation.

The experiments were carried out on a red loam over a stiff retentive subsoil of granitic origin. A three-course rotation was practised of Sudan grass (fed-off), fallow, wheat. The Sudan grass was sown in October, 1924, and continuously eaten down. The paddock was ploughed in July, 1925, harrowed August, skim ploughed March, 1926, springtoothed April, harrowed April. Sheep were put on the fallow when necessary.

An extra skim ploughing and harrowing was given for the late sown trials. The seed-bed was in good condition for the early sowing, but was very wet for the later sowing.

Wheat Variety Trials.

Early-sown Grain Trial.—Seventeen varieties were tried with Hard Federation as a check. The plots were sown in triplicate, each being one-thirtieth of an acre, at the rate of 49 lb. seed per acre and ½ cwt. superphosphate on the 20th April, 1926. The seed was treated with copper carbonate. A good germination was obtained in all plots, but most of the varieties grew fairly tall and were badly shattered by storms. Those which shelled out most were Cadia, Turvey, Waratah, Sands, Rajah, Ranee and Bena. Yandilla King x Zaff x Bomen gave the highest yield, and looked very well from the beginning. Waratah looked promising, but did not yield very well on account of tall growth and consequent shattering by the storm. Bandon appeared very susceptible to "septoria," which killed off

the flag very early in the season. Yandilla King x Zaff x Bomen, which gave the best yield, has been grown for some years, and always gives fair yields; it holds the grain well, which helped considerably on this occasion.

EARLY-SOWN Grain Wheat Variety Trial.

Variety in order of Merit.	Average yield per acre.		Average acre yield since 1924.		Variety in order of Merit.	Average yield per acre.		Average acre yield since 1924.	
	bus.	lb.	bus.	lb.		bus.	lb.	bus.	lb.
Yandilla King x Zaff x Bomen.	25	30	26	9	Indian F x Federation.	17	50	21	49
Wandilla	23	20	24	40	Rajah	17	10	22	1
Guinea	23	10	23	10	Bandon	15	50	19	51
Union	22	20	26	3	Canimbla	15	0	23	5
Onas	21	20	25	39	Ranee	13	40	21	49
Dart's Imperial x Federation.	20	10	23	29	Sands	12	50	19	4
					Waratah	12	20	21	39
Bena	19	30	22	40	Turvey	12	10	12	10
Hard Federation ...	18	40	22	14	Cadia	6	50	18	21
Nullah	18	10	23	6					

Late-sown Grain Trial.—Sowing took place on 3rd June, 58 lb. of seed and ½ cwt. superphosphate per acre being used. The seed-bed was very wet, and some Cape weed survived the cultivations. All varieties germinated well and grew to an average height of 3 feet.

Five new varieties were tried with the following results:—

Duri (Hurst's 14 x Canberra).—Early-maturing, very promising; yielded 28½ bushels per acre.

Guinea.—More suited to a mid-season sowing.

Nabawa (Gluyas Early x Bunyip).—Was outstanding owing to its apparent resistance to flag smut; no trace of this disease appeared in any of the three plots. A yield of 27 bushels 20 lb. per acre was obtained and a good sample of seed.

Robin.—Very early-maturing, but did not appear very promising.

Boolaroo.—Not very promising, gave lowest yield, mainly due to shelling out.

LATE-SOWN Grain Wheat Variety Trial.

Variety in order of Merit.	Average yield per acre.		Average acre yield since 1924		Variety in order of Merit.	Average yield per acre.		Average acre yield since 1924.	
	bus.	lb.	bus.	lb.		bus.	lb.	bus.	lb.
Bandon	30	0	29	14	Hard Federation...	25	40	25	39
Onas	29	10	29	50	Aussie	24	30	26	45
Nullah	28	50	28	22	Sands	23	40	28	13
Gallipoli No. 58 ...	28	40	29	47	Robin	22	10	1st year	
Duri	28	30	1st year		Wagga 55... ...	22	20	23	58
Union	27	50	29	17	Wagga 54... ...	21	50	23	38
Guinea	27	50	1st year		Bena	21	20	26	24
Huff's Imperial ...	27	40	25	54	Waratah	20	40	25	9
Nabawa	27	20	1st year		Boolaroo	18	40	1st year	
Baldry	26	40	25	57					

Early-sown Hay Trial.—The plots were sown on 19th April with 49 lb. seed and ½ cwt. superphosphate per acre. The germination was good and the plots grew tall and thick, giving heavy yields. Zealand was outstanding for a good sample of hay and a heavy yield, but is very late-maturing and susceptible to loose smut. Waratah, Canimbla, and Avoca weighed well and gave a good sample of hay. Baroota Wonder lodged badly.

EARLY-SOWN Hay Wheat Variety Trial.

Variety in order of Merit.	Average yield per acre.				Average acre yield since 1923.			
	t.	c.	q.	lb.	t.	c.	q.	lb.
Zealand	3	10	2	24	2	17	0	15
Waratah	3	4	0	22	2	16	2	0
Canimbla	3	4	0	2	2	12	3	25
Avoca	3	0	3	6	2	18	1	11
Baroota Wonder ...	2	18	1	26	3	4	2	13
Wandilla	2	11	3	7	2	8	0	2

Oat Variety Trials.

Grain Trial.—The following varieties were tried:—Lachlan, Belar, Mulga, Gidgee and Palestine. Sowing took place on the 25th May at the rate of 1 bushel of seed per acre and ½ cwt. superphosphate per acre. Cape weed was plentiful, choking out the oats in patches. Gidgee, Lachlan and Palestine promised good yields. Mulga was very poor. No results were obtained from this trial, as the plots were beaten down by a heavy storm.

Hay Trial.—The plots were sown on the 25th May at the rate of 1 bushel of seed and ½ cwt. superphosphate per acre. A good germination was obtained, but Cape weed kept most of the plots very thin. Belar produced even plots 3 ft. 6 in. high and gave a good sample of hay. Lachlan, Gidgee, Mulga and Kelsall's were very uneven and patchy. Palestine, a new variety, produced a nice even plot, but only grew 18 inches high. This oat is not very suitable for hay, but should yield well for grain.

The yields were as follows:—

Variety in order of Merit.	Average yield per acre.				Average acre yield since 1923.			
	t.	c.	q.	lb.	t.	c.	q.	lb.
Belar	1	13	2	8	2	10	0	1
Lachlan	1	12	0	16	2	6	0	1
Gidgee	1	10	1	22	2	7	0	9
Mulga	1	8	3	20	2	3	3	10
Kelsall's	1	5	2	24	2	1	2	12
Palestine	0	16	3	14	First year grown.			

Fertiliser Trials.

Wheat for Grain.—The plots were sown 21st April with 49 lb. of Hard Federation seed per acre and the various amounts of fertiliser. A good germination resulted in all plots; manured plots grew slightly higher than the unmanured, and matured three days earlier.

FERTILISER Trial with Wheat for Grain.

Treatment.	Average yield.	Increase.	Value of Increase.	Cost of Increase.	Net Gain.	Average acre yield since 1924.
	bus. lb.	bus. lb.	s. d.	s. d.	s. d.	bus. lb.
½ cwt. superphosphate...	21 10	3 10	15 10	2 10	13 0	22 29
1 cwt. superphosphate...	21 0	3 0	15 0	5 8	9 4	22 30
2 cwt. superphosphate...	20 50	2 50	14 2	11 4	2 10	24 10
1½ cwt. superphosphate...	20 20	2 20	11 8	8 6	3 2	23 25
No manure	18 0	....	......	......	......	16 18

Early-sown Wheat for Hay.—The plots were sown with Zealand at the rate of 49 lb. seed per acre and various quantities of superphosphate on 19th April. They grew to a height of 4 feet 6 inches, and some good yields were obtained. The plots were cut on 22nd October, and weighed on 13th November.

Late-sown Wheat for Hay.—Firbank wheat was sown at the rate of 58 lb. seed per acre, with different amounts of superphosphate, on 26th May. The plots were harvested 2nd November, and weighed on 11th November.

FERTILISER Trial with Wheat for Hay.

Treatment.	Average yield per acre	Increase.	Value of Increase*.	Cost of Increase.*	Net gain.	Average acre yield since 1924.
Early-sown Trial (Zealand).						
	t. c. qr. lb.	c. qr. lb.	£ s. d.	s. d.	£ s. d.	t. c. qr. lb.
1½ cwt. superphos.	2 14 1 4	12 1 20	1 17 3	8 6	1 8 9	2 12 2 27
2 cwt. superphos.	2 12 2 20	9 3 8	1 9 5	11 4	0 18 1	2 12 0 3
½ cwt. superphos.	2 12 2 0	9 2 16	1 8 11	2 10	1 6 1	2 5 0 14
1 cwt. superphos.	2 8 3 20	6 0 8	0 18 2	5 8	0 12 6	2 12 2 4
No manure ...	2 2 3 12	....	......	...	......	2 2 0 7
Late-sown Trial (Firbank).						
1½ cwt. superphos.	1 16 0 8	12 0 6	1 16 2	8 6	1 7 8	2 2 1 0
2 cwt. superphos.	1 15 1 12	11 1 10	1 14 0	11 4	1 2 8	2 3 3 14
1 cwt. superphos.	1 14 2 16	10 2 14	1 11 10	5 8	1 6 2	1 19 2 18
½ cwt. superphos.	1 12 2 0	8 1 26	1 5 5	2 10	1 2 7	1 17 0 1
No manure ...	1 4 0 2	....	......	...	......	1 3 3 6

* Valuations:—Hay, £3 per ton; superphosphate 5s. 8d. per cwt.

Superphosphate Applied to Fallow.—An experiment to determine the advantage, if any, of applying superphosphate to the fallow before sowing, instead of with the seed, was conducted. Three applications were tried, viz., (1) 1½ cwt. superphosphate applied to fallow 26th March with combine drill (seed sown 21st April); (2) ¾ cwt. superphosphate applied with the combine 26th March, and ¾ cwt. applied with the seed on 21st April; and (3) 1½ cwt. superphosphate applied at seeding on 21st April. When superphosphate was applied on the fallow—Plots (1) and (2)—Plot (3) was

cultivated only with the combine; the three plots were then again cultivated on 29th March and harrowed on 20th April. Hard Federation at 49 lb. per acre were sown on 21st April.

The results were as follows:—

Treatment (in order of Merit).	Average yield per acre. bus.	lb.
¾ cwt. superphosphate on fallow + ¾ cwt. at seeding	14	30
1½ cwt. superphosphate applied on fallow	10	0
1½ cwt. superphosphate applied at seeding	9	30

Selected versus Non-selected Seed.

Federation.—This portion of the experiment was sown 21st April at the rate of 49 lb. seed and ½ cwt. superphosphate per acre. Plots were sown with (1) Wagga stud seed; (2) seed from Wagga plot, 1925; and (3) seed from Temora plot, 1925. There were more strangers in the seed saved from last year. The plots were harvested 14th December.

Canberra.—This section was sown with seed from similar sources on 26th May with 58 lb. seed and ½ cwt. superphosphate per acre. Generally the plots were poor and thin on one end, due to Cape weed. The plots were harvested on 16th December.

STUD Versus Ordinary Seed.

Seed	Federation				Canberra			
	Average yield per acre.		Average acre yield since 1923.		Average yield per acre.		Average yield since 1923	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Wagga Stud	19	30	22	25	13	40	16	58
From Temora Plot, 1925 ...	18	20	21	25	11	50	16	54
From Wagga Plot, 1925... ...	17	50	22	3	13	10	18	8

Fallowing Experiment.

An experiment to find out the best methods of working a fallow as shown by the yields obtained was conducted. Plots were each ½ acre in area.

Plot 1, Ploughed July, Mulched when necessary.—The plot was ploughed with the mouldboard plough July, 1925, and harrowed; skim ploughed March, 1926; skim ploughed and harrowed May, 1926. Hard Federation seed was sown 1st June at the rate of 58 lb. seed and ½ cwt. superphosphate per acre. Harvested 16th December.

Plot 2, Ploughed July, Mulched February, and after as required.—The plot was mouldboard ploughed in July, 1925, skim ploughed February, 1926, and May, 1926, and harrowed. Hard Federation seed was sown 1st June at the rate of 58 lb. per acre with ½ cwt. superphosphate.

Plot 3, Ploughed July, mulched once in Spring and not again till February.—The plot was mouldboard ploughed July, 1925; skim ploughed November, 1925, February, March, and May, 1926; harrowed May, 1926.

Hard Federation seed was sown 1st June at the rate of 58 lb. seed and ½ cwt. superphosphate per acre. Flag smut was present. Harvested 16th December.

Plot 4, Ploughed after rain in the new year.—The plot was mouldboard ploughed in March, 1926, skim ploughed May, 1926, and harrowed. Hard Federation was sown 1st June at the rate of 58 lb. per acre with ½ cwt. of superphosphate. A fair amount of flag smut was present.

Plot 5, Cultivated soon as possible after Harvest; Ploughed July.—Cultivation was impracticable after harvest, so the plot was ploughed March, 1926, skim ploughed May, 1926, and harrowed. Hard Federation was sown 2nd June at 58 lb. per acre. Considering the few cultivations received, the plot was very even and clean. As the intention of the experiment could not be carried out the results are not published.

Plot 6, Ploughed February, Long Fallow.—The plot was ploughed March, 1925, and harrowed; skim ploughed February, March, and May, 1926, and harrowed May, 1926. Hard Federation seed was sown 2nd June as in the other plots.

Plot 7, Ploughed July, Mulched when necessary.—The same treatment was given as for No. 1. The plot grew even and clean, and equalled Plot No. 1 in giving the highest yield.

YIELDS in Fallowing Experiment.

Plot No. and Treatment (in order of Merit).	Average yield per acre.		Average acre yield. since 1925.	
	bus.	lb.	bus.	lb.
No. 1.—Ploughed July, mulched when necessary ...	25	0	23	6
No. 6.—Ploughed February, long fallow	20	30	18	55
No. 3.—Ploughed July, mulched spring	19	0	19	18
No. 2.—Ploughed July, mulched February and after as required	18	0	20	5
No. 4.—Ploughed after rain in new year	16	40	15	32

Fungicide Experiments.

Yield Test.—These plots were sown on 2nd June with Hard Federation at the rate of 58 lb. seed and ½ cwt. superphosphate per acre. The seed was treated with various proprietary fungicides as well as Departmental mixtures A, B, C, D, and E, and 1½ per cent. copper sulphate solution. Check plots were untreated. The Departmental mixtures were made up as follows:—

Mixture A =	21·2	copper carbonate	+	7·1	calcium carbonate.
Mixture B =	17	„ „	+	11·3	„ „
Mixture C =	14·2	„ „	+	14·2	„ „
Mixture D =	9·4	„ „	+	18·9	„ „
Mixture E =	7·1	„ „	+	21·3	„ „

The copper sulphate solution plot did not germinate as quickly as the others and was always thinner.

FUNGICIDE Yield Test.

Treatment (in order of Merit).	Average yield per acre.	Average acre yield since 1923.	Treatment (in order of Merit).	Average yield per acre.	Average acre yield since 1923.
	bus. lb.	bus. lb.		bus. lb.	bus. lb.
Departmental mixture E	23 30	......	Powdered copper sulphate.	22 30	22 35
Blighty Burgundy ...	23 20	22 55	Departmental mixture B	22 20	.....
Bunticide	23 0	......	Schloesing's vitrioline ...	22 20	.....
Departmental mixture D	22 50	......	Departmental mixture A	22 0	......
Copper sulphate and calcium hydrate.	22 50	.....	Departmental mixture C	21 31	.....
Uninfected untreated ...	22 50	23 58	Copper sulphate solution (1½ per cent.).	18 20	19 40

Fungicide Test.—To ascertain the value of certain fungicides as preventives of bunt, and their effect on the germination of the seed, infected Hard Federation seed was sown, treated with various fungicides. Check plots were sown with infected and untreated seed. The seed was sown by hand on 18th May in rows 2 feet apart and seeds 4 inches in the rows, 100 seeds to each row. Germinations were counted on 3rd June and again on 21st June, 1926. The infected plants were counted 16th December and removed.

FUNGICIDE Test.

Treatment (in order of Merit).	Average germination percentage.	Average percentage of infection.	Treatment (in order of Merit).	Average germination percentage	Average percentage of infection
50 per cent. copper sulphate and 50 per cent. calcium carbonate.	88·3	0	Departmental mixture E	83·	1·6
Departmental mixture A	86·6	0	Basic copper sulphate ...	82·6	·3
Copper carbonate ...	86·6	0	Infected untreated ...	82·6	47
Atomic suplhur ...	86·6	0	Bunticide	82·3	0
Departmental mixture C	85·	0	Departmental mixture D	82·	0
Powdered copper sulphate.	84 3	·6	Departmental mixture B	82·	0
Copper sulphate and calcium hydrate.	84·	3	Blighty Burgundy ...	81·3	·6
Schloesing's vitrioline ...	83·6	0	Treated with Bunticide then reinfected.	80·	0
			Copper sulphate solution (1½ per cent.).	79·	0

STREET SWEEPINGS A MANURE.

THE attention of the Department of Agriculture was lately drawn by the Sydney City Cleansing Engineer to the fact that, owing to the unsuitability for manure purposes of the sweepings now collected from the streets of Sydney, the Sydney Municipal Council has ceased to accept orders for the despatch of such material per rail. A reference to this manure, with price, &c., appears in the book, "Vegetable Growing in New South Wales," produced by the Department, which therefore should be disregarded.

The Origin of Red Hogan Maize.

WHAT is the origin of Red Hogan maize, asked the editor of *Wallace's Farmer*, in a letter to Mr. H. Wenholz, Special Agricultural Instructor. The question was passed on to Mr. E. A. Southee, Principal of Hawkesbury Agricultural College, it being believed that the variety originated on the Hawkesbury River, and a paragraph found its way into the *Windsor and Richmond Gazette*, which a few days later had a visit from Mr. J. B. Miller, of Macquarie-street, Windsor.

Mr. Miller stated that some time after the big flood of 1867 a man named Hogan (Christian name forgotten) arrived in New South Wales from England, and went to the Hawkesbury district. He took with him a small parcel of maize seed, and while in the employ of the late James Upton, who farmed land now occupied by Mr. C. D. Shadlow, dairy-farmer at Cornwallis, it was decided to sow the seed. The crop proved a success, and it was called Hogan's maize.

Mr. Miller and the late Thomas Hulbert went on growing this variety on the farm adjoining Shadlow's (now owned by Mr. Miller himself), and for years afterwards won every competition with it at the Hawkesbury Show. Mr. Miller added that Mr. P. Holland, of Freeman's Reach, is still growing maize directly derived from some seed obtained from his father. The early-day crops were said to be a beautiful sample of small, yellow maize with a red tint.

Confirmation of some of the above details was furnished by Mr. G. Nicholls, of Freeman's Reach, who wrote to the Principal about the same time. Mr. Nicholls says one of the first settlers of the Hawkesbury district named Hogan, owned a farm at Cornwallis. This Mr. Hogan imported from America seed maize, which he subsequently distributed among the other settlers, and the maize, being of a red variety, became known as Hogan's Red. Mr. Nicholls added that he had heard these details from old hands when he was quite young.

CROSS POLLINATION OF PRUNES.

EXPERIMENTS carried out at Yanco Experiment Farm during the last five or six years leave no doubt whatever that Robe de Sargeant prunes crop much better if cross pollinated. On each occasion when blossoms from other varieties—Angelina Burdett, Prune d'Agen, &c.—have been placed in Robe de Sargeant trees the yield has been increased considerably. On the last occasion that the experiment was carried out, the blossoms were placed in the trees that had previously formed the check block, while the trees that previously had the advantage of cross pollination were held as checks. The Orchardist, Mr. W. W. Cooke, reports that the cross-pollinated trees still gave the greatest yields, and it is not considered necessary to continue the experiment.—F. G. CHOMLEY, Manager, Yanco Experiment Farm.

Maize Trials in the Gundagai District.

G. NICHOLSON, Agricultural Instructor.

DURING the past season Mr. Ian Macdonald, of "Dalkeith," Gundagai, co-operated with the Department in carrying out a variety trial with maize.

The Season.

Soaking rains were recorded during the winter months and the precipitations were favourable to growth until January, after which extremely dry conditions prevailed. The total rainfall for the growing period was 5½ inches. When this is taken into consideration the yields as a whole must be regarded as very satisfactory and as indicating the suitability and productiveness of the alluvial soils of the Gundagai district for maize growing.

RAINFALL.

Stubble and Fallow Period.		Growing Period.	
	Points.		Points.
June	178	November ...	70
July	365	December ...	148
August	349	January	282
September	234	February ...	37
October	322	March	18
Total	1,448	Total	555

The experiment was situated on a deep, friable alluvial soil, facing the river, which has been periodically enriched by deposits of flood silt. Apart from the selection of a fairly uniform area of land, the plots received no special treatment over and above the commercial areas of maize surrounding them. The land, which has been cropped continuously to maize for the past six years, was ploughed to a depth of 7 inches during the latter part of September, harrowed once and disc-harrowed twice in October, and harrowed again shortly before planting. The growing crop received two harrowings, and one cultivation.

Planting was carried out on 9th November, four grains being dropped every 32 inches, in rows 4 feet apart. A good shower of rain shortly after planting assured a good germination in all plots. Favourable conditions prevailed until shortly after tasselling, after which the crop had to rely upon reserves of moisture stored up in the soil from the previous winter. The plots were harvested on 27th May, 1927.

Notes on Varieties.

Funk's Yellow Dent.—This variety is well known to maize growers of the Gundagai district, and its popularity is well founded. It again proved its suitability to local conditions by outyielding all other varieties in the trial by 14 to 31 bushels.

Hempel.—A variety received by the Department of Agriculture from a Victorian farmer by the name of Hempel who claims to have achieved a great deal of success with it, and considers it superior to Funk's Yellow Dent. Tested out alongside Funk's Yellow Dent it did not compare favourably in yield or trueness of type. Hempel shows a great deal of variation in type, but the predominating type approximates very closely to Funk's Yellow Dent, though it is a little earlier in maturity, and the stalks stand up much better, it being apparently freer from root and stalk rots.

Meadowbank.—An early-maturing variety recently introduced into this country by a seed merchant. The cobs are 9 inches to 10 inches long, slightly tapering and of small circumference. They carry ten to fourteen rows of grain (mostly ten), with a medium furrow between the rows. The grain is light amber in colour, of medium width and thickness, shallow, and the dent is smooth. A fair amount of variation of type was noticeable and the variety does not appear to show much promise.

Jewell's Star.—This is also an early-maturing variety, recently introduced into Australia by a seed merchant. The cobs are small, averaging 8 inches to 8½ inches long, slightly tapering, and of small circumference They have sixteen to eighteen rows of grain, which are tightly packed, and the furrow between the rows is shallow. The dent is shallow and smooth to slightly roughened, and the grain is amber coloured, small, plump, more or less oval-shaped and of medium depth Jewell's Star is of fairly uniform type, shows promise of being useful and is worthy of further trial

YIELDS of Variety Trial.

Variety.		Yield. bus.	lb.
Funk's Yellow Dent	(1½ cwt. superphosphate)	124	23
" "	(1 " ")	123	37
" "	(½ " ")	103	20
Goldmine Crossbred	(½ " ")	89	15
Golden Glow	(½ " ")	86	0
Jewel Star	(½ " ")	82	24
Hempel	(½ " ")	78	29
Golden Superb	(½ " ")	78	20
Meadowbank	(½ " ")	72	5

ROTATION AND RICE-GROWING.

IN a recent report, the officer-in-charge of rice investigations for the United States Department of Agriculture stressed the value of a rotation of crops, which, he said, may produce beneficial results on succeeding crops in numerous ways. It may serve to unlock fertility already in the soil and make it available to succeeding crops; it certainly improves the physical condition of the soil by the addition of humus and by inducing better air drainage. In the case of a legume crop, such as soybeans, nitrogen is taken from the air and added to the soil for future use. Rotation may also serve the purpose of preventing the growth of various disease organisms that may thrive in the soil when their host plants are grown continuously.

Lucerne for the Inland Dairy Farmer.

E. O. DALGLEISH, H.D.D., Senior Dairy Instructor, and W. D. KERLE, H.D.A., Senior Agricultural Instructor.

ALTHOUGH there are many thousands of acres under lucerne in the inland districts of this State, the practice most in vogue is to utilise the crop for hay rather than for grazing. Even in such well-known lucerne-growing districts as Mudgee, Canowindra, and Forbes, it is quite unusual to find lucerne used as a pasture for dairy cows, though it is frequently used as a pasture for fattening lambs or for lambing ewes, or even for pigs. During the past few years, due to a succession of good seasons, stocks of lucerne hay have accumulated as prices have not been high, and it is evident that this fodder must, with wheaten and oaten hay, suffer in price from the increasing use of motor power both on the farm and in the cities. This being the case, it is not surprising to find that increasing areas are being grazed off, but principally by sheep.

The "King of Fodders" is the graziers' salvation in time of drought, and in the summer months an acre of it will support an incredible number of stock. Undoubtedly, if it were grown to the extent it might be along the inland rivers, New South Wales would have little to fear from droughts. Although most suited by the rich alluvial river flats, lucerne will thrive almost anywhere once it becomes established. Away from the flats, it will in a dry time, show little growth, yet no plant responds more quickly to rain. Of lucerne it has been said that "the only place it will not grow is where it is not sown," though this is hardly the case. It is not proposed in this article to deal with lucerne-growing away from the rivers.

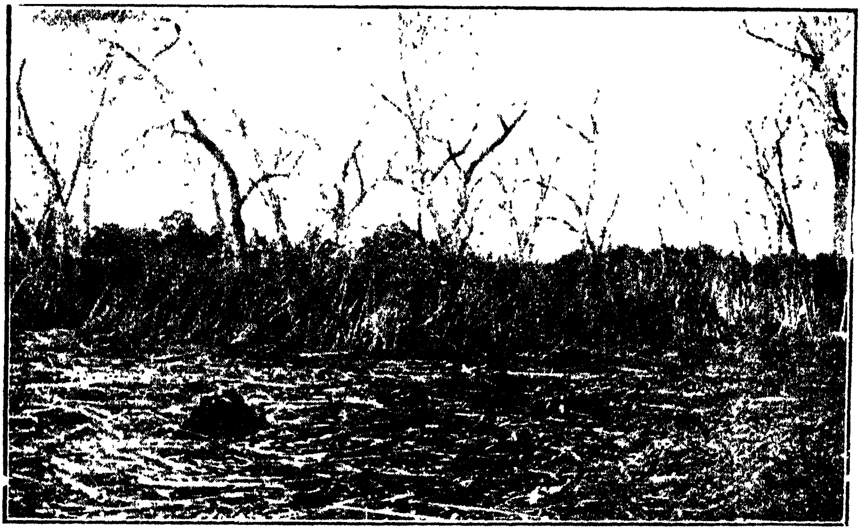
It is only during the past ten years or so that the river flats in many inland districts have been regarded as of much value. The rich alluvial country is not suitable for sheep, and, being held mainly by large estates, has been made little use of. The river flats in autumn, winter, and spring in good seasons are usually covered with a dense growth of grass and herbage; frequently such plants as the variegated thistle (*Carduus lanceolatus*) reach heights of 10 or 12 feet, while the wild tobacco (*Nicotiana glauca*), false castor oil plant (*Datura stramonium*), marshmallow (*Malva parviflora*), and others combine to form a jungle-like growth. Sheep cannot cope with these vast quantities of fodder, and besides are liable to disease through the low-lying nature of the ground. The sheepowner usually shifts his flocks to undulating country during the winter, and returns them to the river flats in the summer months when the ground is dry and grass and herbage dead.

On most of the inland river flats water is obtainable at shallow depths, and it is this that makes the flats so suitable for lucerne growing. The lucerne plant is naturally deep-rooting, and after being established a few

years on river land the roots eventually find their way to underground supplies of moisture. The plant will then defy any drought, and during the driest times will make prolific growth. For the farmer who is prepared to put a sufficient area under lucerne on the rivers, the grazing of this land by dairy cows will offer returns which are well worth while, as the following instance will show.

A Successful Venture.

Some five years ago Messrs. Connell Bros. acquired a block of 320 acres of river land on the Murrumbidgee, about 20 miles down the river from Gundagai, and 13 miles from Tumblong railway station on the Tumut line. Their experiences are of value to other farmers, because the land they are



Typical Unimproved Inland River Country in the Summer.
Note the dense dry growth of variegated thistles.

farming is typical of the thousands of acres of land which extend for hundreds of miles along the inland rivers. The land was practically in its virgin state, except that the timber was dead, and the whole area was covered with the usual impenetrable growth of variegated thistle. The idea was conceived of eventually placing the whole area under lucerne, and at the present time 120 acres have been planted, 90 acres of which are being used for grazing the milking herd of seventy-five cows. It is considered by these farmers that about 20 acres of lucerne is the ideal area for a herd of that size to graze off rapidly, and the land should be subdivided to that extent. They have practically no trouble from "bloat" or hoven, which is prevented by watching the cattle for the first few days. After the first few days the "lucerne taint" leaves the milk and is not noticeable after that time if the cows are continually grazed on lucerne. A continual diet of

lucerne is, however, not an ideal ration for the milking herd—the cows become tired of it, as naturally they will of any single fodder fed continuously. For this reason it is advisable to vary the diet occasionally with the natural pasture, even if this be dry. During the cold winter months, lucerne of course makes little growth, and at this time of the year the green natural pasturage must be largely depended on for fodder.

For six months of the past year Connell Bros. returns have averaged 1 ton of butter per month from seventy-five cows, and even in the winter months their production never fell below 1,000 lb. of butter per month. Returns like these speak for themselves, and the writers are prepared to declare that little if any better returns can be secured on the Coast on land

Part of Messrs. Connell Bros.' Herd grazing Lucerne at Tumblong.

which would cost anything from four to ten times the amount Connell Bros. paid for their land—£12 10s. per acre. With a dairy herd of this size a considerable number of pigs are of course kept, and in addition, a fair area of maize is planted each year.

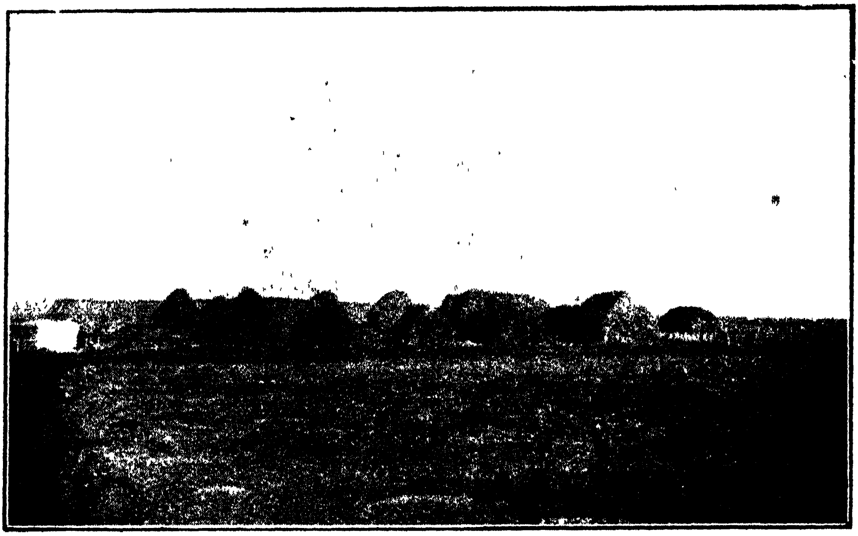
To Establish a Stand on a River Flat.

The district along the Murrumbidgee from Wagga to Gundagai is more favoured as to rainfall than areas further west, so that lucerne is probably easier to establish there, and in other districts not so favoured it is necessary either to take advantage of wet seasons, or resort to irrigation to establish a good stand of lucerne. As regards irrigation, of course, Murrumbidgee land is favoured by the continuous summer flow maintained in the river by water released from the great storage at Burrinjuck, but eventually there will be similar storage reservoirs at the heads of other great inland

rivers. The alluvial land on the banks of the inland rivers is ideal for the growth of lucerne, but the area selected should not be liable to lengthy inundation, or to become waterlogged in time of flood.

In establishing a lucerne stand, the first essential is correct preparation of the seed-bed. While this presents no great difficulty, it is remarkable how indifferently lucerne land is usually prepared, particularly in view of the cost of seed, &c. Thorough tillage operations are probably more essential for lucerne than for any other main crop, since the stand is to last for many years.

The controlling factors in the satisfactory establishment of lucerne areas in these districts are good moisture at seeding time, and weed growth. It is essential, therefore, to adopt similar methods to those of the successful

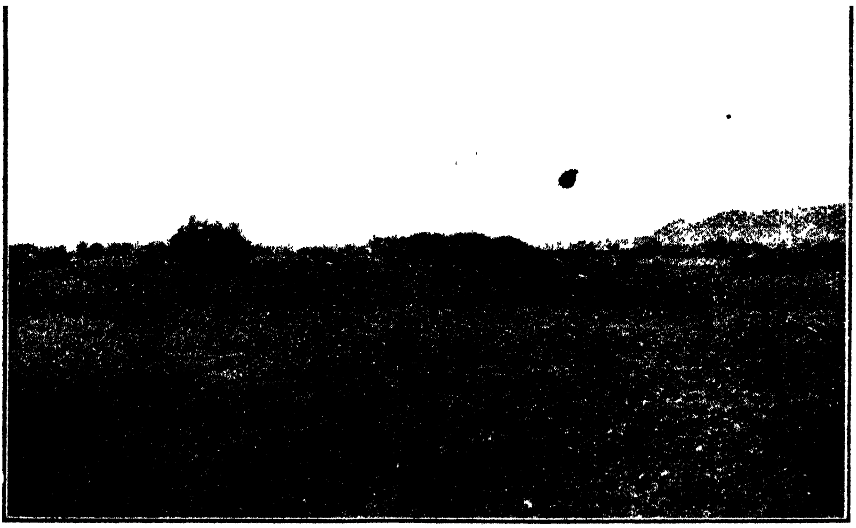


Some of the Many Stacks of Lucerne Hay to be seen around Cootamundra.

wheat-grower, and commence the preparation of the ground by fallowing ten to twelve months before sowing. The initial ploughing should be deep and followed by the harrow if the ground be in a cloddy condition. Every effort should be made to have the soil in good tilth by spring to induce the germination of weed seeds. It is the weed growth that occurs early in the following spring when the lucerne is making its first growth that governs the success or failure of the crop. It is advisable, therefore, to encourage by every means the growth of weeds on the fallow in the spring and summer, and to destroy them when very young by means of harrows or tine cultivators and by the use of sheep. The cultivations should be made to a shallow depth, and reploughing should be avoided with the object of destroying the maximum number of weeds in the top few inches of soil, without turning

up fresh weed seeds from the lower soil. It is impossible, even with a twelve months fallow to rid the soil of weeds, if fresh weed seeds are continuously brought up from the bottom by deep cultivations or reploughings.

The cultivations which are necessary to control weed growth, if done correctly, should result in a fine seed-bed, well supplied with moisture in early autumn. This is the most favourable season of the year for sowing on the inland river flats, as it enables the young plants to become established before spring, and gives them a big start over weed growth. To ensure a good germination it is essential that the soil be fine, and well supplied with moisture, and the seed be plump and of good quality. Very little soil covering is required, deep sowing being particularly responsible for poor germination.



Lucerne Flats on Mr. V. D. Cox's "Burundella" property, Mudgee.
The flats are used exclusively for the production of lucerne hay.

The seed can be sown broadcast, but large areas are most satisfactorily done through the grass seed attachment to the ordinary wheat drill or with the superphosphate through the manure box, allowing the seed to fall in front of the hoes, which should be set to just travel on the surface of the soil.

The quantity of seed required is approximately 12 lb., and with it at sowing time should be applied ½ to 1 cwt. of superphosphate per acre. It is advisable sometimes, to roll the surface immediately after sowing if the moisture is not very close to the surface, to cause the moisture to rise and produce a more even germination. The employment of a "nurse" crop of wheat or oats is not essential. The first cut from the newly established field will probably contain considerable weed growth: it should be made therefore before the weeds seed, and should be followed by the harrows.

It is apparent from the poor stands of lucerne frequently seen—stands overrun with weeds and not yielding anything like the crop they should—that efficient after-treatment of established fields is not carried out in the central-west. The harrows or narrow-tined rigid or springtooth cultivators should be used several times during the growing season and autumn, and particularly towards the end of winter, followed by top dressing with 1½ to 2 cwt. of superphosphate per acre. Damage to the crown of the plants may result from the use of disc implements, and they are not recommended. The timely use of cultivating implements will result in cleaner crops by destroying weeds, and heavier yields by conserving moisture and aerating the soil. When the lucerne is used chiefly for grazing, stirring the soil to prevent it becoming set and to distribute more evenly the animal droppings, should be regarded as particularly essential. The harmful effect on the physical condition of the soil, and consequently the plant, of grazing lucerne fields when in a wet condition should be fully realised.

Lucerne can be Marketed as Dairy Produce.

To supply continuous feed throughout the year no plant is so valuable as lucerne: even in winter time a green pick is always available. While the value of stored lucerne hay for drought periods is well known, farmers do not seem to realise that lucerne can be more economically stored as silage. The amount of lucerne from the first cut of the season that is raked up and burnt because of weed growth, would amount to hundreds of tons of silage per annum on the Lachlan River flats between Cowra and Forbes alone. It is time that lucerne-growers, by correct treatment of their soils, got rid of weed growth so that the first cut could be utilised for hay, or that they realised the commercial possibilities of ensiling lucerne.

At the present time most farmers engaged in lucerne growing depend on droughts to make their money. This is, at best, a haphazard method of procedure—droughts fortunately do not happen every year. While it is always advisable, even for the lucerne-grower, to have a reserve of hay put aside, continual cutting and storing as hay, of three or four years' growth of lucerne means a heavy outlay of capital which the small farmer can ill afford, and there is always the risk of total loss by fire or floods. To convert even a portion of the growth from lucerne into dairy produce means constant and remunerative returns, with a lessening of the serious waste which each year takes place in the fodder from lucerne lands.

Apart from the dairying aspect of the question, there is another which affects the whole State. During the past four years there has been, owing to good seasons and high prices for wool, an unprecedented increase in the number of sheep carried in the State: in these four years the number of sheep carried has increased by nearly 60 per cent. to 54,000,000—the highest number held for over thirty years. It needs little imagination to foresee what will happen when the inevitable drought again comes, and when it

does, it will be the lucerne-growers who will play a large part in keeping alive the flocks of owners who either cannot or will not provide for themselves. Lucerne growing should be encouraged by every possible means, not only for the benefit of the lucerne-growers themselves, but for the State as a whole.

Departmental Fertiliser Mixtures.

In consequence of the general use of high-grade superphosphate in place of the 17 per cent. quality so long on the market, it has become necessary to revise the formula of a number of the mixtures used by the Department for various crops, and in order to avoid confusion it has also been decided to use new numbers by which the various mixtures are known. The following list will, therefore, be of interest:—

M16 ...	... 5	parts superphosphate;	2 parts sulphate of ammonia.	
M17 .	... 2	„ „	1 „ „ „	
M18 ...	... 4	„ „	3 „ „ „	
M19 ...	... 2	„ „	1 part nitrate of soda.	
M20 ...	... 3	„ „	2 „ „	
M21 ...	... 1	„ „	1 „ „	
M22 ...	... 1	„ „	1 part bonedust.	
M23 ...	... 10	„ „	3 parts sulphate of potash.	
M24 ..	... 4	„ „	3 „ „	
M25 ...	... 10	„ „	3 parts muriate of potash	
M26 ...	... 4	„ „	3 „ „	
M30 ..	.. 10	„ „	4 parts sulphate of ammonia;	3 parts sulphate of potash.
M31 ..	... 10	„ „	5 „ „	3 „ „
M32 ...	... 4	„ „	3 „ „	3 „ „
P11 ...	... 6	„ „	1 part sulphate of ammonia.	
P12 ...	... 6	„ „	1 part sulphate of potash.	
P13 ...	... 6	„ „	1 part sulphate of ammonia;	1 part sulphate of potash.
P14 ...	... 3	„ „	1 part sulphate of potash.	
P15 ...	... 3	„ „	1 part sulphate of ammonia.	
P16 ...	... 3	„ „	1 part sulphate of potash;	1 part sulphate of ammonia.

Fodder Crops for Sheep.

For too long we have held to the habit of considering sheep as grass-eaters, and that it is grass paddocks that are required for sheep. An excellent opportunity exists to increase the stock-carrying capacity of holdings by the growing of crops, which will produce good feed when the natural grasses will not move. Such crops act as a tonic as well as feed, and enable better use to be made of what rough grass is in the paddocks. Furthermore, sown crops invariably give a heavier growth than natural herbage, even under the most favourable conditions for the latter. A good crop of oats, barley, or wheat will carry from ten to twenty sheep per acre for a lengthy period in the spring. When a crop is available on which sheep can be kept at this period, the grass can be saved until it has made a good growth, and a heavy crop of feed is thus provided that will carry the sheep through the summer. Even on purely grazing properties it is found that the carrying capacity can be largely increased if the sheep can be kept off the grass at this period.—A. H. E. McDonald at the R.A.S. Animal Husbandry Conference.

"THE HARVEST OF YEARS."

THE death of Luther Burbank in the early part of 1926 removed a most interesting figure among students of plant life. His achievements have doubtless been overestimated by ardent admirers, but the originality and even daring of many of his activities, together with the success that attended some of them, invest him with a reputation all his own and quicken expectations as one opens this book of 300 pages.

It is not strictly an autobiography, but during the last few years of his life Burbank had begun to collect from his own voluminous writings material for a book that would express "his thoughts, reactions, observations, and philosophies." The work was interrupted by his death, but it was continued and concluded by Mr. Wilbur Hall, his associate in the task, and we now have a volume that presents the well known naturalist as a "gallant, lovable, kindly, shrewd, whimsical" personality whose doings, with his speculations and ramblings thereon, make rather unique reading. If we look for detailed and technical description of the steps by which he achieved the spineless cactus, or the improved Japanese plums, or the Shasta daisy, or any of the other plants with which his name was connected, we find ourselves disappointed. We are informed that in "eight years I disposed of no less than seven hundred different varieties of flowers, trees, shrubs, vines, and grains, and I had enough newspaper notice to have satisfied Barnum." We also learn that he paid collectors of cactus plants thousands of dollars and spent more than sixteen years on the work of removing the spines from the plants. We get, too, the story of how he "speeded-up production," so that, starting with nothing necessary to the job except the land, he was able in nine months to deliver 19,500 young prune trees to a man who was in a hurry to plant an orchard! But about the doing of all this sort of thing we gather little. We do read "something you will not read in text-books," and also that "it knocks a lot of so-called scientific theories into a cocked-hat" (page 235), and we are tempted to pass judgment accordingly. Primarily, in fact, Burbank was a nurseryman—"a gardener touched with genius" as de Vries wrote.

However, the sphere of nature that enabled Burbank to perform the wonders attributed to him was also spacious enough for many original philosophical dissertations that will, perhaps, instruct and entertain the reader.

Published by the Riverside Press, Cambridge, Massachusetts, U.S.A. Our copy from Angus and Robertson, Ltd., Sydney.

WATER FOR DAIRY COWS.

MILK contains on an average 87 per cent. water, and it has been found that water must always be available and easy of access, so that the cow will go and have a drink whenever she feels inclined. If she has to travel far for it, or it is difficult to get at, she will not drink until driven by excessive thirst. This means a reduction of yield and a loss of profit Cows in milk require water according to the quantity of milk they are giving. The ordinary milking cow should have at least 10 to 12 gallons of water per day. A Friesian cow giving 10 gallons of milk daily would drink 20 to 30 gallons of water daily.—R. T. ARCHER in the Victorian *Journal of Agriculture.*

Water Conservation for Domestic Supplies.

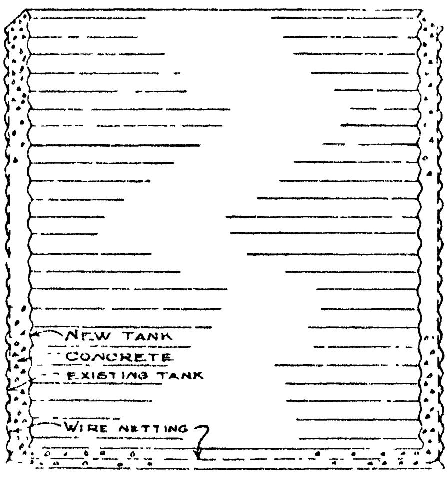
N. L. JONES, Supervising Architect.

As a means of conserving water for general purposes galvanised corrugated iron tanks have been and are now largely used, chiefly because of the low initial cost. The objection to them for this purpose is their comparatively short life, and for the storage of domestic supplies, the effect that atmospheric temperature has on the water.

A concrete tank overcomes these objections, but is very often too costly to be considered. This cost is contributed to largely by the forms necessary for casting, and where the tanks are elevated—a prime consideration in domestic supplies—by the strong supports necessary to sustain the great weight.

To those who already possess galvanised corrugated iron tanks which will no longer hold water, the benefits of a concrete tank may be had at a cost approximating that of a new corrugated iron tank by adopting the following procedure.

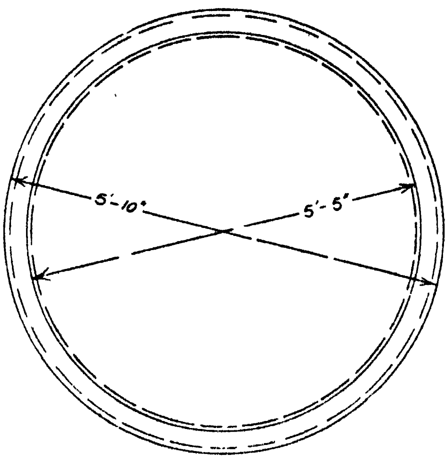
Remove the top of the old tank by cutting close round the wall and reserve the top for the new tank. Fix wire netting, preferably 2-in. mesh, to the wall of the tank, and secure this in position by tie wire passed through holes specially punched in the tank for the purpose.



Section of Corrugated Iron and Concrete Tank.

On the bottom of the tank lay a concrete floor 1 inch thick; on top of this set wire netting as for the walls, and then place another 1 inch of concrete, making a total thickness of 2 inches. While this concrete is still wet, take two sheets of new corrugated iron, previously curved to a diameter 5 inches less than the old tank, and secured at the laps with galvanised roof bolts set with the heads inside; set this in position inside the tank, thus leaving a 2½-inch cavity all round. Now fill concrete into the cavity in small quantities, and carefully tamp solid; the "watertightness" of the tank is dependent on the efficiency of this tamping. Having concreted the cavity to the top of the first ring, take two more sheets, fix in position and concrete as before, and do likewise with a third set.

To enclose the tank take the top that was removed from the old tank, set it in position, and turn down the projecting edge into the wet concrete to secure the top against wind pressure. When all the cement liquid that has run through the holes in the old tank has dried, scrape reasonably clean and apply one coat of oil paint.



Plan of Tank.

The materials required to line a 1000-gallon tank will be :—Six 9-ft. sheets of 26 gauge corrugated iron curved to 5 ft. 5 in. diameter; 2 doz. ½-inch galvanised roof bolts; 8 yards of 72 in. x 2 in. x 18 gauge netting, 1 cubic yard of coarse sand, and seven bags of cement. Total cost in Sydney, £5 12s. The concrete should be gauged one part cement to three parts sand.

Herd or Strain Improvement.

In the improvement of a herd or strain, whether of animals or plants, the breeder's aim is to perpetuate all variations from the standard toward superiority, and to cull out all variations toward inferiority. The individuals resulting from his breeding operations must not only approach the ideal he has set himself, but must also produce individuals that, when mated to similar individuals, will produce offspring of similar type and quality; in other words, they must breed true. Although a breeder may produce very fine individuals, if they do not breed true he is a failure.—W. J. Spafford in the South Australian *Journal of Agriculture*.

"Sweet" and "Sour" Silage.

The production of "sweet" or "sour" silage depends chiefly upon the temperature of the material in the pit at the time of making, and this in turn, is dependent upon the access of air. When the pit is filled and pressure is applied rapidly so that the air is excluded from the material, the temperature does not rise high, allowing vigorous action of acid-producing bacteria, resulting in the formation of quantities of volatile and fixed acids which cause "sour" silage. "Sweet" silage, on the other hand, is produced when the pit is filled slowly before being compressed. In this case the air has comparatively free access to the material, and a high temperature is induced, resulting in the destruction of the acid-producing bacteria and the consequent production of only a relatively small amount of acids.—H. C. Stening, Chief Instructor of Agriculture.

A Pig-raising Competition.

E. R. SMITH, Honorary Secretary, Cooper's Shoot Branch of the Agricultural Bureau of New South Wales.

THE organisation of competitions in fallowing, in growing of crops and in fodder conservation by agricultural societies, branches of the Agricultural Bureau and kindred institutions has become popular during the past few years. These have proved of great educational value to the competing farmers, and the practical benefits that have resulted are apparent in the improvement of the standard of farming that follows in districts where competitions have been in vogue for several years.

An interesting extension of the scope of these competitions has been made by the Cooper's Shoot Branch of the Agricultural Bureau, which recently ran a pig-raising competition among its members. The main idea was to try and encourage the use of more prolific sows than average, and the contest was for the production of the greatest number of pounds of pork from one litter in the shortest time. Results proved fairly encouraging, especially as very few dairymen were able to fatten a litter of ten or twelve at once and keep the other pigs moving along. This meant that a period of a month or six weeks elapsed from the time the first consignment was marketed till the rest of the litter left the farm. Another fact that may be considered is that the pigs were fed almost entirely on skim milk.

The following are the results of the three leading competitors:—

The winning litter consisted of twelve pigs and was owned by Mr. G. Marshall. The mother of this litter was a pure-bred of the Old Berkshire strain, and the father a pure-bred Middle York. The pigs were farrowed on the 1st September, fifteen in the litter, of which thirteen were reared. One was destroyed when fat and made a good bacon pig, thus there were twelve pigs in the competition. They were fed entirely on skim milk, and had the run of a paspalum paddock, until penned for fattening. The fattening was done in three lots of four each, since there was only enough milk to keep four going.

The first four were killed on 13th February, when they were 166 days old. They weighed 559 lb. of pork, making an average of 139¾ lb., or 3.36 lb. for each day from date of birth. The next four were killed on 1st March, 181 days from birth. They weighed 541 lb. of pork, averaging 135¼ lb. for each pig and 3 lb. for each day from date of birth. The last lot was killed on 21st March, when 202 days old, and they weighed 538 lb. of pork, averaging 134½ lb. for each pig, and 2.66 lb. for each day from birth.

The twelve pigs made an average of 9.02 lb. of pork for each day from date of birth.

It will be noticed that feed plays an important part when pigs are stores, as the youngest pigs showed a better average than the oldest ones. All pork was A1.

The second prize was won by a litter of eleven pigs owned by Mr. E. Smith. This litter was farrowed on 28th September by a pure-bred Duroc Jersey sow, to a pure-bred Middle York boar. There were thirteen pigs in the litter, but two died within a day of birth, and the remainder had a slight set-back for a few days owing to the sow not making any milk—probably a slight attack of milk fever. The mother was fed three times a day throughout, and the pigs were weaned when about nine weeks old. When weaned they were allowed to run at will in a fenced-in run with only a little grass to graze. Owing to a large number of pigs being on hand there was a shortage of milk, so that as stores they were not over-fed.

This litter was taken to the factory in four lots—the first on 3rd February and the last on 6th May. During the fattening period the pigs were fed on skim milk and wheat meal three times a day. Fattening was held back owing to large supply of pigs on hand.

The eleven pigs made a total of 1,634 lb. of pork and an average of 7.9 lb. of pork per day.

Mr. V. Armstrong came third with a litter of eleven pigs which were farrowed by a Berkshire sow which had been crossed with a Tamworth. They were born on 23rd October, and the first batch of six was sent in on 17th March, 145 days after birth, with an average weight of 92.6 lb. of pork. The remainder of the litter was consigned on 21st April, when 180 days old, with an average of 95 lb. pork per pig.

These pigs were fed on skim milk four times a day, and the first batch received a little maize and the second a little pollard and water to make up the required amount of food. It will be noticed that the second lot averaged only 3 lb. heavier than the first, though kept an additional thirty-five days. This, no doubt, was the result of being kept as stores for a period, and also of the water in the pollard ration, which does not fatten.

The Value of Grading Seed Wheat.

In any good ear of wheat will always be found both good and poor type grain; some grains are plump and well developed, others are small and occasionally pinched. And the same features are naturally present in any bulk seed sample. Experience has shown that these plump, well-developed grains give rise to stronger and heavier yielding plants than the smaller types of grain. Clearly, too, since the acre yield of any crop must ultimately be dependent upon the mean yield of its individual plants, there is advantage in sowing large, plump, well-developed grain to the exclusion of the smaller, less developed grain. Hence, the value of systematically grading all seed wheat.—A. J. Perkins, in the South Australian *Journal of Agriculture*.

Concrete Silo Construction.

A. BROOKS, Works Superintendent.

THE concrete silo has the advantage over all others of permanency and stability. It will last indefinitely, it is not likely to blow over or rot out, and it cannot be destroyed by white ants. For the man who wants a lasting job, and who can obtain the necessary materials at reasonable cost, the concrete silo is strongly recommended. Some knowledge and skill are necessary in construction, however, for while it is quite possible to get a handy farm carpenter to erect a timber silo and make a satisfactory job, it is doubtful if such a man could be relied upon to make an equally good job of a concrete silo, more especially of the reinforced type.

Three types of concrete silo can be recommended in the following order of merit: (*a*) The circular solid-wall silo (Figs. 1, 2, and 3); (*b*) the octagonal solid-wall (Figs. 4, 5, and 6); and (*c*) the block silo (Figs. 7, 8, and 9). The last may be either of the hollow type of blocks or of solid blocks, the latter being more easily made. Carefully and skilfully constructed, the three types of silo are equally strong and durable. The block silo is the cheapest to build because the blocks may be made and built up in any convenient number, while with the other two classes of structure the building must go on continuously until completed.

The Materials.

The selection of the materials for concrete is very important. The cement must be from fresh stock, because if it has absorbed any moisture and become lumpy and hard it is unfit for use. It should be stored in a dry place, preferably on a wood floor raised above the ground. The sand requires to be fairly coarse, and must be clean and free from all vegetable matter. Fine sand requires more cement to make an equally strong job. The stone may be river gravel or crushed rock graded to size, the latter being at all times preferable. River gravel, in which the sand is mixed, should be screened in order that the exact proportion of sand to stone may be ascertained and if necessary corrected. A simple method of doing this is to screen the sand out of a kerosene tin full of the river gravel, and then pour water into the tin until the tin flows over; then pour into another kerosene tin the water in the first tin. The quantity of water so obtained represents the quantity of sand required to correctly fill the voids or spaces between the stones; that is, to a kerosene tin full of stone only, sand equal to the depth of water should be added.

It must be borne in mind that the spaces or voids between the stones for concrete must be filled with mortar made of sand and cement, and that it is always advisable to have a little more mortar, rather than less, than what the measuring indicates to be necessary.

Sand contributes from half to one-third of the amount of material used in making concrete. The largest part is stone, which should be passed through a screen of 1½ inch mesh for walls, and 2½ inch mesh for foundations or floors. Generally speaking, a good mixture is 9 cubic feet of stone and 4 cubic feet of sand to each bag of cement. If less cement is used, the concrete

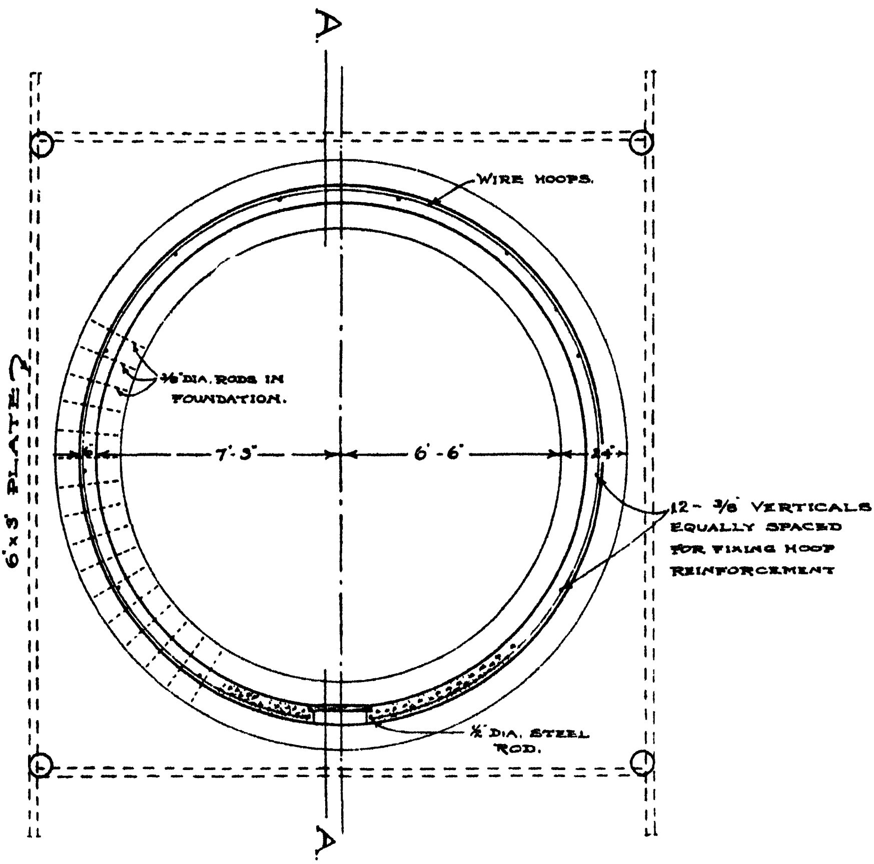


Fig. 1.—Plan of Circular Solid-wall Concrete Silo.

walls may be porous and admit the air, and rain may even soak through. A good mortar for building the blocks or plastering the inside of the silo may be made of 3 parts sand to 1 part cement.

Quantities of Materials required for a 100-ton Silo.

For either type of concrete silo as recommended, the walls being 6 inches thick, height 30 feet, and diameter 14 ft. 6 in., exclusive of concrete floor (as only in rare cases is this necessary) the materials mentioned in the subjoined

lists will be required. From these lists the farmer can select all that he may be able to provide, and what he will have to purchase.

STONE, SAND, CEMENT, WIRE, &c.

1½ inch screened stone	30 cubic yards.
Sand	20 cubic yards.
Cement	5½ tons.
¼ inch round steel rod	26 lb.
⅜ inch deformed steel rod	½ cwt.
No. 4 black wire...	1 cwt.
No. 8 black wire...	1 cwt.
No. 18 tie wire	3 lb.

ROOF MATERIALS.

4 only round poles, 30 ft. long x 7 in. at top end.
4 in. x 2 in. hardwood, eight 22 ft. braces for poles.
6 in. x 3 in. hardwood, two 22 ft., and two 18 ft., top plates for roof.
6 in. x 1¼ in. hardwood, one 22 ft. ridge board.
4 in. x 2 in. hardwood, eighteen 12 ft. rafters.
4 in. x 2 in. hardwood, eight 12 ft. collar ties.
3 in. x 1½ in. hardwood, 300 ft. lineal, for battens.
3 in. x 2 in. hardwood, two 22 ft. ladder sides.
2 in. x ¾ in. hardwood, one 18 ft., for ladder rungs.
3 in. x 2 in. hardwood, 75 ft. lineal, for elevator frame.
9 in. x 1 in. pine, 70 ft. lineal, for elevator sides.
6 in. x 1 in. pine, 120 ft. lineal, for elevator bottom.
3 in. x ¾ in. hardwood, 100 ft. lineal, for elevator carriers.
12 in. x 2 in. pine, three 8 ft. lineal, to cut door planks.

IRON WORK.

57 sheets 6 ft. 26 gauge corrugated iron for roof.
4 lengths 16 in. x 26 gauge ridge capping.
8 lengths 4 in. x 24 gauge guttering.
1½ doz. 4 in. brackets for guttering.
8 lengths 2½ in. x 24 gauge down pipe.
50 ft. of 1 in. x 18 gauge hoop iron for ladder.

BOLTS, &c.

4 only strap bolts for angles of roof plates.
8 only 4 in. x ⅜ in. cuphead bolts for above.
2 only 1½ in. x ½ in. hooks for top of ladder.
4 only 3½ in. x ⅜ in. bolts for top of ladder.
12 only 8 in. x ½ in. cuphead bolts for braces on posts.
3 only 4½ in. x ½ in. cuphead bolts for braces on posts.
4 only 6 in. x ½ in. cuphead bolts for post heads.
14 only 19 in. x ⅜ in. cuphead bolts for elevator frames.
7 lb. 3 in. x 10 gauge wire nails.
4 lb. 2 in. x 11 gauge wire nails.
7 lb. 1¾ in. galvanised roofing screws.
7 lb. lead washers.

ELEVATOR FITTINGS.

The length of elevator required for a silo standing 26 feet out of the ground will be 33 feet, the complete fittings, comprising sprocket, chains, wheels, take-ups, bolts, &c., can be quoted for and obtained from Sydney firms. Probable cost, £15.

Cost of a 100-ton Concrete Silo.

The cost of materials and labour required depends so much on local conditions that no definite amount can be stated, but from the list of materials given, the builder can furnish an estimate for the whole job in his own particular district. Where the farmer is able to supply portion of either materials

or labour, he can arrive at the actual outlay necessary to complete the job. As a general estimate, where the whole of the materials and labour have to be provided and paid for at current rates, the cost of concrete silos, of 100-ton capacity, may be put down at 40s. to 45s. per ton. Larger silos will cost less to erect per ton, probably down to 35s.

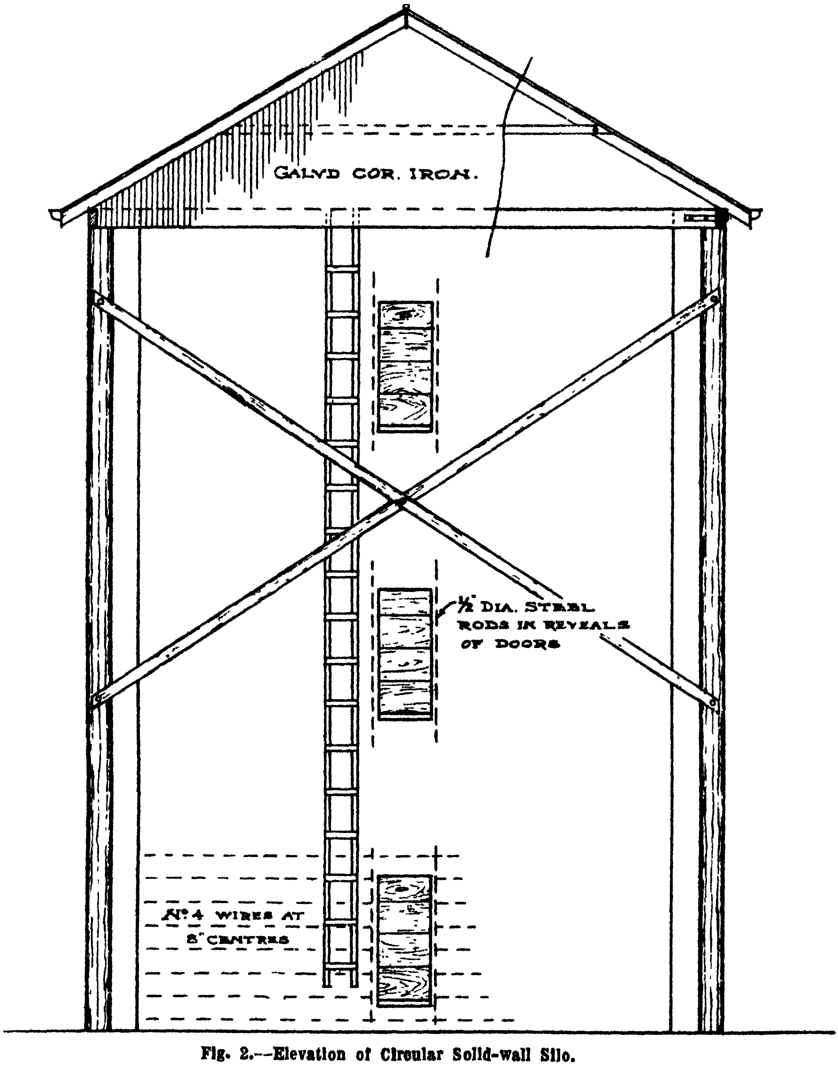


Fig. 2.—Elevation of Circular Solid-wall Silo.

Forms or Moulds for the Walls.

The building of solid concrete walls requires some kind of form or boxing to hold the concrete in position until it sets, and it is convenient first to describe the making of these forms. They are represented in Figs. 11 to 15. Obviously they must be very rigid and strongly made, so that there will be

no movement of the forms when the concrete is being packed. There are on the market several types of all-steel plants, complete with hoists, scaffolding, and concrete mixer, all in one unit, but the cost is prohibitive, except for a contractor or firm specialising in the building of silos.

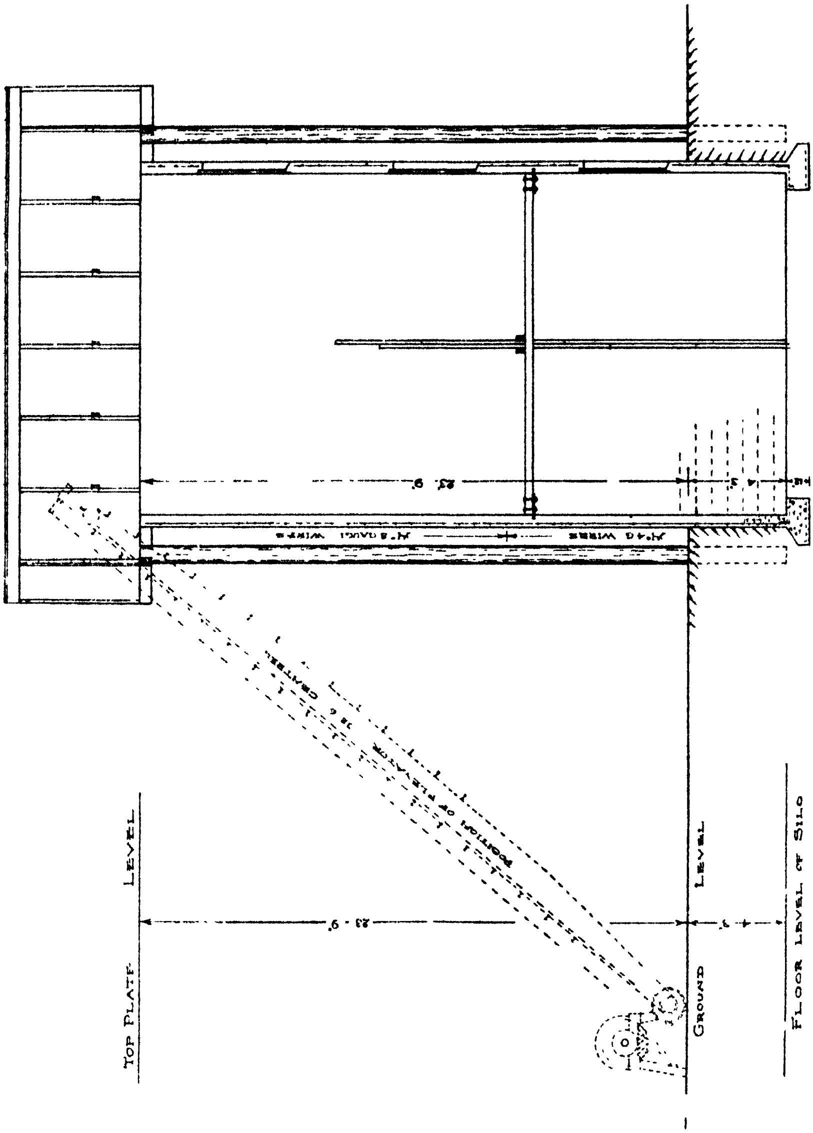


Fig. 3.—Cross Section, A—A, on Fig. 1.

Wooden moulds, faced with iron, are better than wood alone, as the water does not then affect the timber. The quality of timber used in making forms should be of the best, and oregon pine is recommended. For circular silos, the forms should be made in eight sections each, for the outside and

inside of the wall. The depth may vary from 2½ to 4 feet, but to suit the stock sizes of sheet-iron, from 30 inches to 36 inches is recommended.

Where quicker work is required a double set of forms will be necessary, one set being placed on top of the other, making it possible to fill 5 ft. 9 in. of the walls in one day (see Figs. 10 and 11). Where available labour is limited to say two men for the work, a single set of forms will be found sufficient for the day's work.

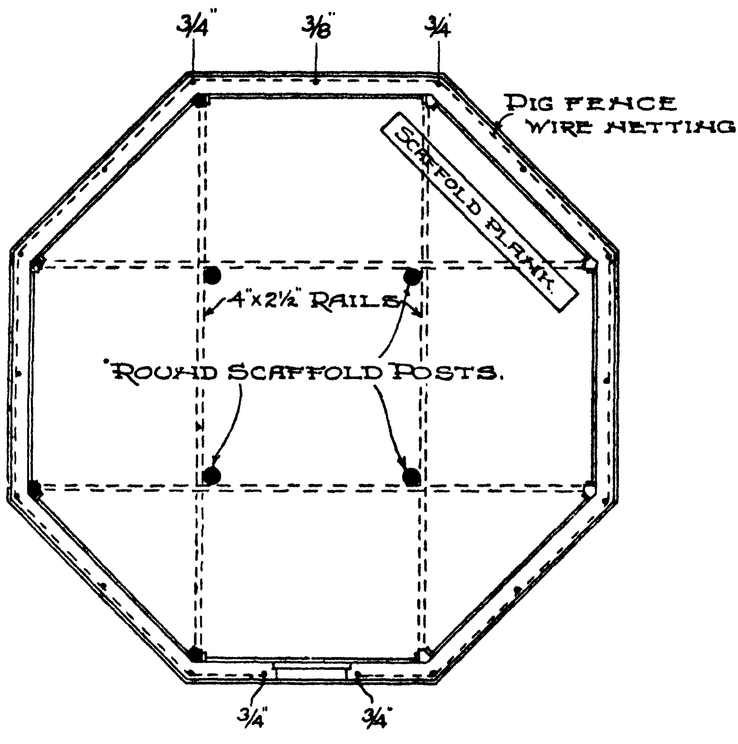


Fig. 4.—Plan of Octagonal Concrete Silo, showing Framing for Concrete.

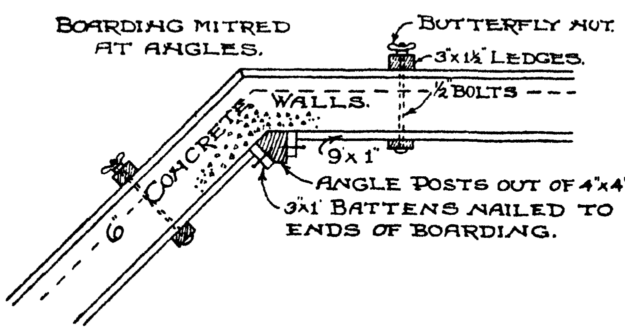


Fig. 5.—Detail Plan of Corner of Octagonal Concrete Silo, showing Forms.

A very serviceable single set of forms can be made of corrugated iron, the inner side of the form being faced with plain iron to give a smooth face to the inside of the concrete, while the outside is corrugated. The sheets of corrugated iron being only 27 inches wide, an extra half-sheet is riveted on to make the forms 34 inches wide, with which the walls can be raised about 30 inches each day. This width also suits the width of plain iron (36 inches) used to face the inside of the form.

Each sheet is curved to the radius required, and secured to 3 in. x 1½ in. hardwood vertical battens with roofing screws. Through these battens the

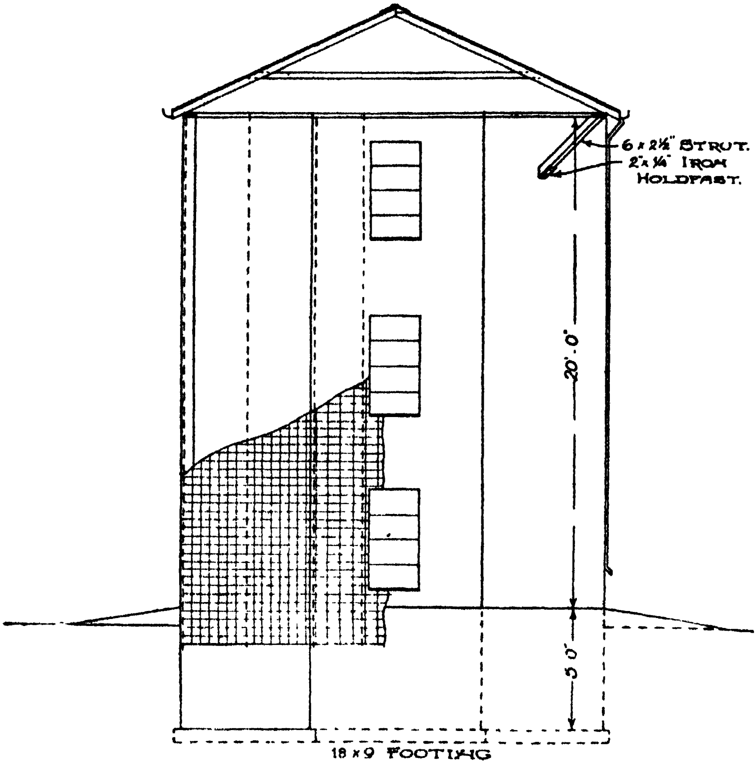


Fig. 6.—Section and Elevation of Octagonal Concrete Silo.

bolts to hold the forms in position are passed (see detailed section of mould, Fig. 12). There are eight sheets or sections in each ring, two battens being screwed to each, and one end of each sheet left free for the lapping joint.

The materials required to make a set of these forms are as follows :—

12 sheets 7 feet long, 22 gauge corrugated iron.
12 sheets 6 feet long, 24 gauge corrugated iron.
8 sheets 6 ft. x 3 ft. long, 26 gauge plain iron.
100 feet lineal, 3 in. x 1½ in. hardwood battens.
3 lb. No. 9 tinman's rivets.
3 lb. solder.
3 lb. 1¾ inch roofing screws.
32 only 11 in. x ⅜ in. cuphead bolts.

Figure 16 shows the lay-out of the moulds, and position of the battens and bolts. The outer joints lap about 10 inches, and the inner only 3 inches. The plain iron facing to each inside sheet is closely riveted and soldered to the corrugated sheet, and kept back 3 inches from one end, the distance of the lap. The lapping joints are numbered 1 to 8; at No. 8 (the closing joint) he plain iron is kept back 4 or 5 inches, so that the forms are more easily

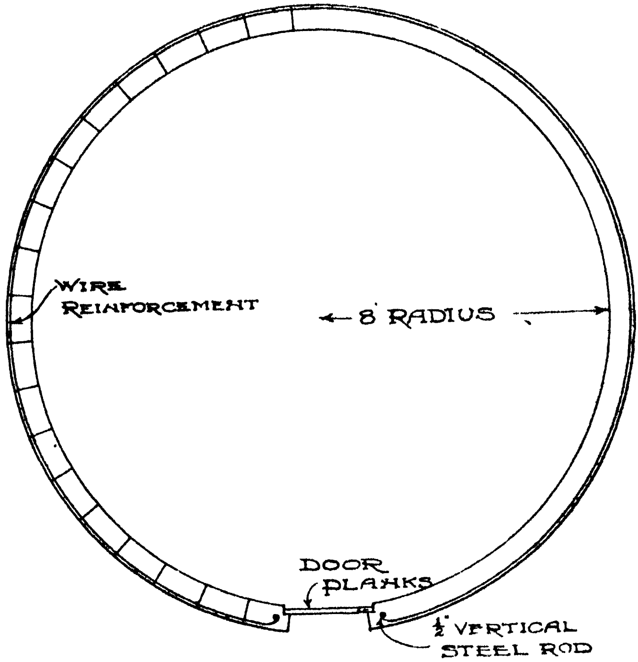


Fig. 7.—Plan of Concrete Block Silo.

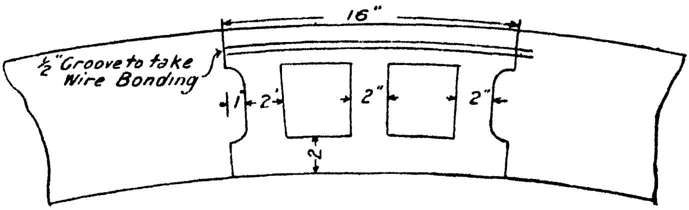


Fig. 8.—Plan of Concrete Block.

taken apart when they have to be raised. To make good the space between the ends of the plain iron at No. 8 joint, a loose strip of plain iron about 4 inches wide, can be placed before the concrete is poured into the forms. When taking the forms apart to raise them, this No. 8 joint is the first to be loosened (see Fig. 14 for details of the joints).

Having the sheets already curved, proceed as follows:—Mark out on a flat surface (preferably a wood floor), circles to the outside and inside diameters of the silo, and from the centre mark out sixteen radiating lines, equally

divided around the outer circle. Then set up the curved sheets on their edges, lapped, and temporarily fixed together at the joints, and over the lines on the floor mark upright lines on each sheet. On these lines mark out the bolt holes and punch them through. The battens are then screwed on, and the holes bored through the battens. The battens require to be 36 inches long, which allows 2 inches to stand above the top edge of the form, to take the spacing batten (see Fig. 12).

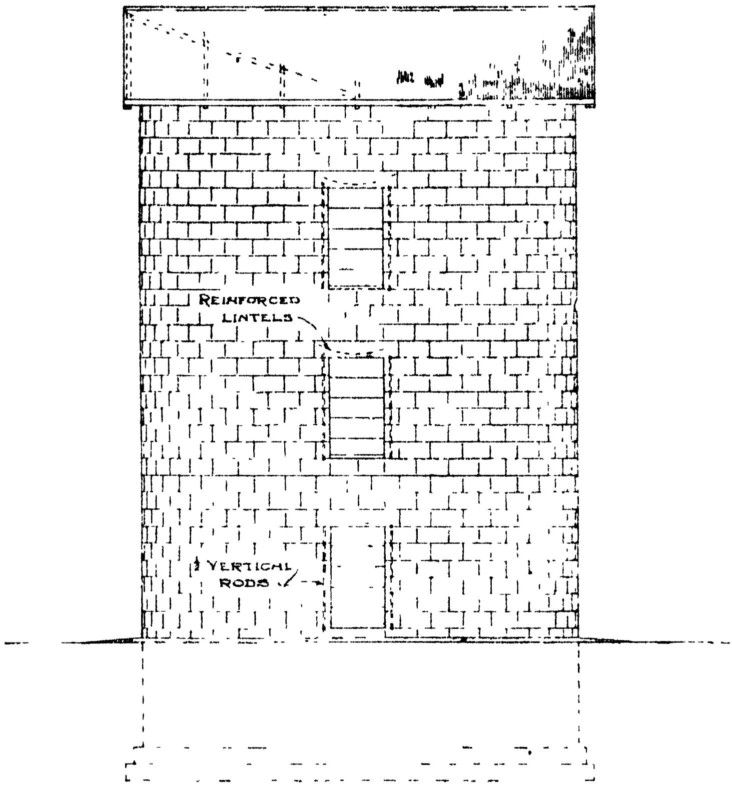


Fig. 9.—Elevation of Concrete Block Silo.

Mixing the Concrete.

Continuous mixing, such as can only be done by a machine, is undoubtedly the best, but it is only where a number of silos are to be erected that the purchase of a mixing machine could be recommended. Hand mixing if carefully done is quite suitable, and if the directions given are followed it will be found most suitable for the erection of one or two silos.

A good platform to mix on can be made of scaffold planks, laid close together on a flat bed of sand, any open joints being filled in with sand to prevent the liquid cement running through. A useful size is about 12 ft. x 10 ft.

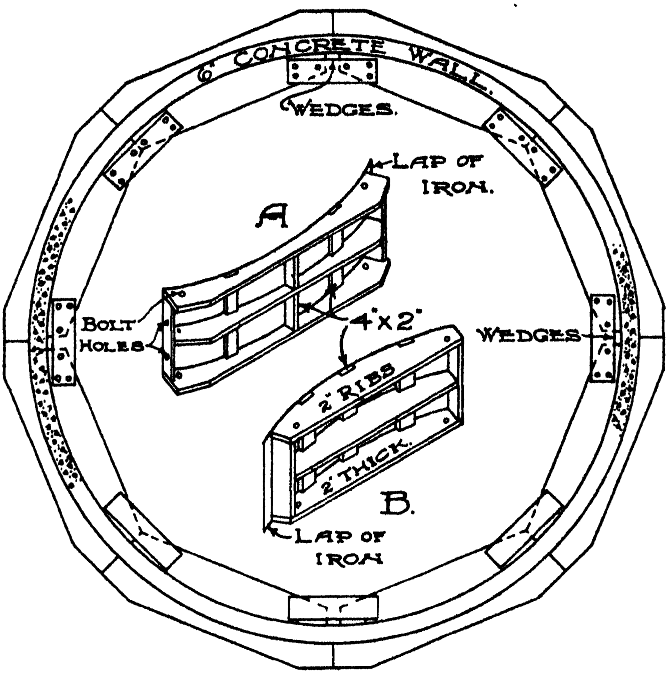


Fig. 10.—Plan of Circular Concrete Silo, showing Wooden Forms faced with Plain Iron.

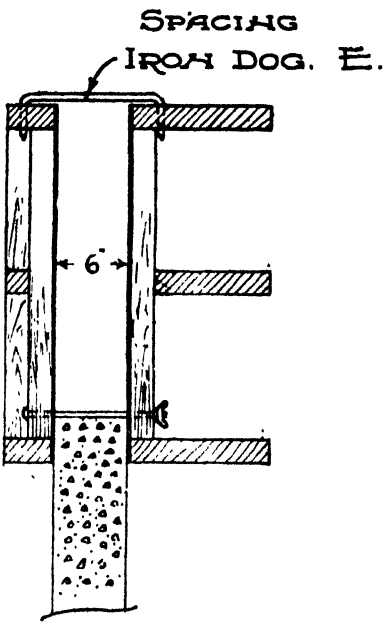


Fig. 11.—Section of Wall, showing Position of Wooden Forms (single set).

To correctly measure the quantities of materials, a gauge box is required. This can be made as indicated in Fig. 19, which simply shows a box 4 feet long, 2 ft. 3 in. wide, and 12 inches deep (inside measurement), which will contain 9 cubic feet or one-third cubic yard. The box is placed on the platform near to one side, filled with the stone, and lifted away, placed again near the heap of stone and about half filled with sand. On top of the sand one bag of cement* is emptied. The box is now removed and the mixing proceeded with; this is easiest done with square-mouthed shovels. Two men work, facing each other, turning over the sand and cement until the colour is uniform;

* The bag of cement referred to is the jute bag, which contains $1\frac{1}{2}$ cubic feet, not the paper bag now used by some firms, which contains only one cubic foot.

they next spread it over the stone, then twice turn over the whole while it is dry and again turn over with the shovels twice while it is being watered from a hose sprinkler or watering can, until the whole mass is uniformly wet, but not sloppy. The water should not be poured on as when mixing mortar, and the consistency of the concrete should be just such that it will run together

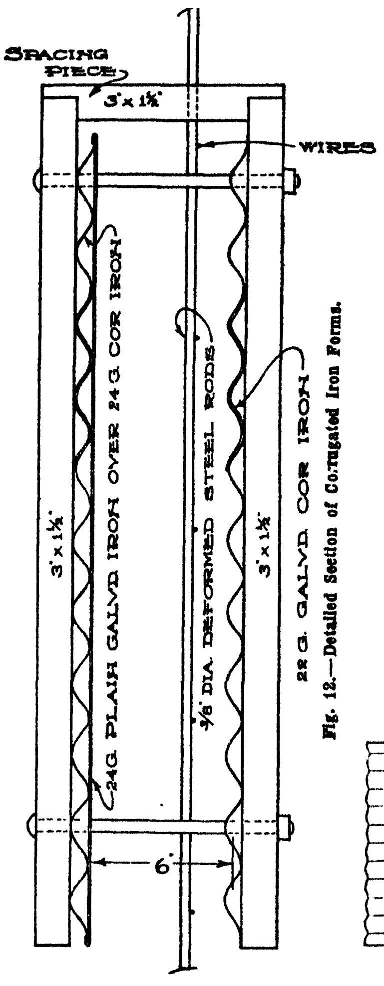


Fig. 12.—Detailed Section of Corrugated Iron Forms.

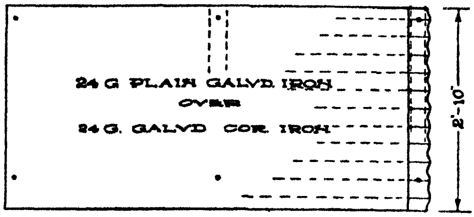


Fig. 13.—Elevation of Inside Form.

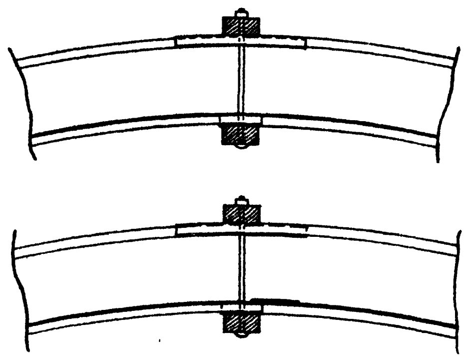


Fig. 14.—Details of Joints.
The lower plan shows the slip joint (No. 8 joint).

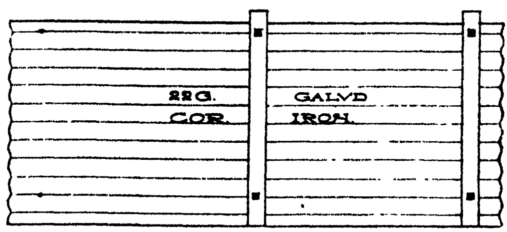


Fig. 15.—Elevation of Outside Form.

when placed in the forms. It is not advisable to mix larger batches than 9 cubic feet, because the cement begins to set in about thirty minutes, and 9 cubic feet is as much as two men can place in that time.

The proper mixing of the dry sand and cement can be improved on by using a garden rake after the first turning with the shovels.

(*To be concluded.*)

The Codling Moth.

(*Cydia pomonella*, L.)

PART II.

S. L. ALLMAN, B.Sc. Agr., Assistant Entomologist.

THE codling moth is regarded as the most serious pest of apples and pears, and has been the subject of many experiments since the adoption of arsenate sprays for its control. Investigations have been carried out in two directions. In the first place, a study of the life-history has been made to arrive at detailed and accurate information in order to make possible the correct timing of sprays so as to obtain the best results. The second line of investigation has been to demonstrate the merits of high and low pressures, of fine and coarse sprays, and of the various types of nozzles.

This paper deals with some aspects of the life-history of the moth at Bathurst Experiment Farm, New South Wales, during the season 1926–27, and will be followed by a further paper on miscellaneous studies, including the occurrence of parasites and predators.

The definition of terms used, and the presentation of the data, are similar to those employed by members of the United States Bureau of Entomology, in their departmental bulletins dealing with the codling moth.

The Insectarium.

The life-history studies were carried out in a gauze-covered insectarium, consisting of a frame structure 16 feet long and 12 feet wide, with a maximum height of 10 feet and sloping to a minimum height of 8 feet. The breeding jars were shaded and protected from excessive wind by awnings. The insectarium was protected by a large apple-tree.

A thermograph was continually operated in the insectarium. and the average daily temperature was computed from the thermograph record for each two hours. The average temperatures used in connection with the oviposition records were obtained by averaging the thermograph record for each two hours from 2 till 8 p.m.

Definition of Terms.

A "brood" includes the individuals of any one generation and may be spoken of as "first brood," "second brood," or "third brood," to denote the generation to which they belong.

A "generation" commences with the egg stage and terminates with the emergence of the adult or moth, and may not be completed in the same season as the eggs are deposited.

The "life cycle" of any generation is the time from the deposition of the egg to the mergence of the adult. The "complete life cycle" includes also the pre-oviposition period of the moth, and is therefore the time between the deposition of eggs of succeeding enerations.

"Overwintering larvæ" include all non-transforming larvæ of the first, second, or third broods of the preceding season.

The "spring brood" of pupæ are pupæ from the overwintering larvæ.

The "spring brood of moths" are those emerging from the spring brood of pupæ.

The "spring brood" includes—
- All overwintering larvæ from the preceding season.
- The spring brood of pupæ.
- The spring brood of moths.

The first generation includes—
- The first brood of eggs (deposited by spring brood moths).
- The first brood of larvæ, both transforming and overwintering.
- The first brood of pupæ.
- The first brood of moths.

The second generation includes—
- The second brood of eggs (deposited by first brood moths).
- The second brood of larvæ, both transforming and overwintering.
- The second brood of pupæ.
- The second brood of moths.

The third generation (incomplete at Bathurst) includes—
- The third brood of eggs (deposited by second brood moths).
- The third brood of larvæ, all of which are overwintering larvæ.

Overwintering Larvæ.

A number of non-transforming larvæ were collected during the preceding season and allowed to overwinter in the field in breeding cages. These, together with a number of larvæ collected in the field in the spring, were used to obtain the time of pupation, and the length of the pupal stage of the spring brood of pupæ of the codling moth.

Pupæ of the Spring Brood.

Time of Pupation.—The first pupa was found on 13th September, and the next pupation occurred on 24th September. The maximum pupation took place on 24th October, and the last pupation under observation on 29th November. The time of pupation of 229 individuals and the influence of the average daily temperature are illustrated in Fig. 1.

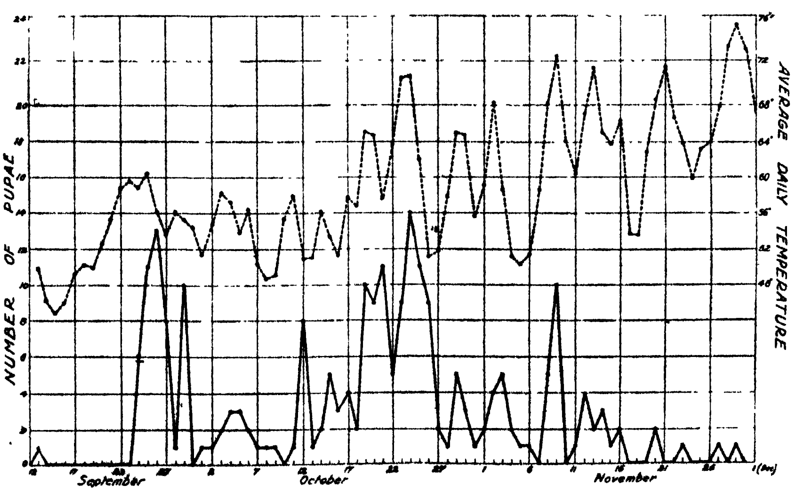


Fig. 1.—Pupation of the Spring Brood of the Codling Moth at Bathurst, 1926–27.

Length of the Pupal Stage.—Table 1 gives the pupal stage of 210 pupæ of the spring brood. The length of the pupal stage becomes greatly reduced as the season advances and the temperature increases.

TABLE 1.—Length of pupal stage of pupæ of the spring brood of the codling moth at Bathurst, 1926–27.

Date of Pupation	Number of pupæ	Pupal period in days.			Date of Pupation	Number of pupæ	Pupal period in days.			Date of Pupation.	Number of pupæ.	Pupal period in days.		
		Average.	Maximum.	Minimum.			Average.	Maximum	Minimum			Average.	Maximum	Minimum.
24 Sept.	6	32·33	35	30	15 Oct.	4	24·50	25	24	1 Nov.	2	21 50	22	21
25 ,,	10	32·80	35	26	16 ,,	3	24·00	24	24	2 ,,	4	22·25	23	22
26 ,,	12	33·50	35	33	17 ,,	3	33·00	23	23	3 ,,	5	21·40	23	20
27 ,,	8	33·25	34	32	18 ,,	1	22·00	22	22	4 ,,	2	22·00	22	22
28 ,,	1	32 00	32	32	19 ,,	9	22·44	24	22	5 ,,	1	21·00	21	21
29 ,,	9	32 00	34	30	20 ,,	9	22 78	24	21	6 ,,	1	20·00	20	20
1 Oct.	1	30·00	30	30	21 ,,	11	22·00	24	19	8 ,,	5	19·40	20	19
2 ,,	1	31·00	31	31	22 ,,	4	22·50	23	22	9 ,,	9	18 44	19	18
3 ,,	2	29 50	30	29	23 ,,	9	21 44	22	21	11 ,,	1	19·00	19	19
4 ,,	3	29·33	30	29	24 ,,	13	22 15	23	21	12 ,,	3	18 33	19	18
5 ,,	3	28 00	28	28	25 ,,	10	23 50	25	21	13 ,,	1	21·00	21	21
6 ,,	1	32·00	32	32	26 ,,	9	24 11	25	24	15 ,,	1	18·00	18	18
7 ,,	1	30·00	30	30	27 ,,	2	24 00	24	24	16 ,,	2	17·50	18	17
9 ,,	1	28 00	28	28	28 ,,	1	24·00	24	24	20 ,,	2	16·00	17	16
11 ,,	1	27·00	27	27	29 ,,	5	22·40	23	22	23 ,,	1	17·00	17	17
12 ,,	8	26 17	27	25	30 ,,	3	22 67	23	22	27 ,,	1	15·00	15	15
13 ,,	1	26 00	26	26	31 ,,	1	22·00	22	22	29 ,,	1	19·00	19	19
14 ,,	2	25·50	26	25										

Total number of pupæ, 210.
Average length of pupal period in days, 24·92.
Average length of pupal period, males, 25·10 days; females, 24·84 days
Maximum length of pupal period, males, 35 days; females, 35 days.
Minimum length of pupal period, males, 17 days, females, 15 days

Moths of the Spring Brood.

Time of Emergence.—The first moths emerged on 19th October, when about half the petals had fallen from the apple blossoms and the calyx sprays were being applied. Moths continued to emerge until 9th January, giving a total emergence period for the spring brood of moths of eighty-three days. The maximum emergence took place between 13th November and 30th November. The emergence of 1,153 moths of the spring brood is illustrated in Fig. 2.

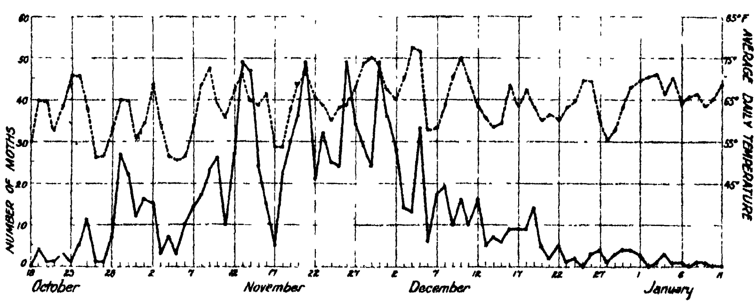


Fig. 2.—Emergence of the Spring Brood of Moths at Bathurst.

Oviposition by the moths of the spring brood.—Oviposition records were obtained from 418 spring brood moths. In one instance eggs were laid upon the day of emergence, but this was quite exceptional. The average pre-oviposition period was 4·22 days, with a maximum of eighteen days. The maximum oviposition occurred 9·11 days after emergence, and eggs were deposited over a period of 14·08 days. Table 2 gives the complete data for thirty-six cages, containing 383 moths. These data are for the cages of moths and not for individuals.

Some difficulty was experienced in obtaining oviposition records with small numbers of moths, and consequently the limits of oviposition of the various broods of moths, when only stragglers were emerging, are somewhat shortened.

TABLE 2.—Oviposition by moths of the spring brood in breeding jars at Bathurst.

Observation.	Number of Moths.	Sex.		Date of—				Number of days—				Total number of eggs deposited.
		Male.	Female.	Emergence.	First Oviposition.	Maximum Oviposition	Last Oviposition	Before Oviposition.	From emergence to Maximum Oviposition.	Of Oviposition.	From emergence to last Oviposition.	
1	10	6	4	25 Oct. ..	31 Oct...	15 Nov.	15 Nov.	6	21	16	21	6
2	6	3	3	28 ,, ..	30 ,,	11 ,,	12 ,,	2	14	14	15	121
3	16	8	8	29 ,, .	31 ,,	9 ,,	14 ,,	2	11	15	16	319
4	10	7	3	29 ,, ..	8 Nov.	15 ,,	21 ,,	10	17	14	23	184
5	13	7	6	30 ,, ..	2 ,,	11 ,,	12 ,,	3	12	11	13	27
6	9	5	4	1 Nov...	9 ,,	12 ,,	12 ,,	8	11	4	11	34
7	7	5	2	4 ,, ..	11 ,,	13 ,,	20 ,,	7	9	10	16	84
8	11	3	8	7 ,, ..	9 ,,	15 ,,	28 ,,	2	8	20	21	97
9	12	6	6	8 ,, .	11 ,,	21 ,,	2 Dec.	3	13	22	24	34
10	14	8	6	9 ,,	27 ,,	27 ,,	27 Nov.	18	18	1	18	1
11	12	8	4	10 ,, ..	13 ,,	14 ,,	23 ,,	3	4	11	13	17
12	9	5	4	11 ,, .	20 ,,	20 ,,	24 ,,	9	9	5	13	65
13	18	10	8	12 ,,	15 ,,	19 ,,	3 Dec	3	7	19	21	261
14	11	6	5	13 ,, ..	13 ,,	20 ,,	3 ,,	nil	7	21	20	353
15	8	3	5	13 ,, ..	15 ,,	20 ,,	29 Nov.	2	7	15	16	106
16	13	6	7	14 ,, ..	22 ,,	25 ,,	10 Dec.	8	11	19	26	120
17	12	5	7	16 ,, .	20 ,,	29 ,,	6 ,,	4	13	17	20	136
18	16	8	8	19 ,, ..	29 ,,	29 ,,	29 Nov.	10	10	1	10	1
19	10	6	4	20 ,, ..	23 ,,	23 ,,	5 Dec.	3	3	13	15	124
20	13	5	8	21 ,, .	23 ,,	30 ,,	9 ,,	2	9	17	18	200
21	9	5	4	22 ,, ..	27 ,,	30 ,,	11 ,,	5	8	15	19	92
22	12	6	6	23 ,, .	29 ,,	30 ,,	20 ,,	6	7	22	27	84
23	5	2	3	24 ,, ..	30 ,,	30 ,,	30 Nov.	6	6	1	6	1
24	12	5	7	25 ,, ..	28 ,,	18 Dec.	23 Dec	3	23	26	28	126
25	12	7	5	26 ,, ..	28 ,,	29 Nov	30 ,,	2	3	23	24	217
26	14	6	8	27 ,, ..	29 ,,	3 Dec.	10 ,,	2	6	12	13	328
27	15	7	8	28 ,, ..	29 ,,	4 ,,	19 ,,	1	6	21	21	350
28	9	2	7	29 ,, ..	30 ,,	9 ,,	22 ,,	1	10	23	23	215
29	10	5	5	30 ,, ..	3 Dec.	5 ,,	11 ,,	3	5	9	11	60
30	10	6	4	1 Dec.	3 ,,	4 ,,	10 ,,	2	3	8	9	141
31	10	6	4	2 ,, .	4 ,,	4 ,,	15 ,,	2	2	12	13	29
32	11	5	6	3 ,,	4 ,,	18 ,,	23 ,,	1	15	20	20	118
33	6	3	3	4 ,,	7 ,,	10 ,,	13 ,,	3	6	7	9	79
34	6	3	3	5 ,, .	10 ,,	10 ,,	26 ,,	5	5	17	21	14
35	6	4	2	7 ,, ..	10 ,,	10 ,,	23 ,,	3	3	14	16	18
36	6	2	4	10 ,, .	12 ,,	16 ,,	23 ,,	2	6	12	13	9
	Average ...			...	...	...	...	4·22	9·11	14·08	17·30	.
	Maximum ...			...	...	...	...	18	23	26	28	
	Minimum ...			...	...	...	...	..	2	1	6	

Number of male moths	194
Number of female moths	189
Total number of moths	383
Total number of eggs	4,171
Average number of eggs per female moth	22·07
Maximum number of eggs per cage (14) per female moth	70·60

Number of eggs per female moth.—The average number of eggs per female in the breeding jars was 22·07, 189 moths depositing 4,171 eggs. There was considerable variation in the number of eggs deposited per female per cage, and the maximum occurred in jar 14, five moths depositing 353 eggs, or an average per female of 70·60 eggs.

Length of life of moths.—Table 3 gives the length of life of 217 male and 201 female moths.

TABLE 3.—Length of life of male and female moths of the spring brood at Bathurst.

Male.		Female.		Male.		Female.		Male.		Female.	
Length of Life.	Moths.	Length of Life.	Moths.	Length of Life.	Moths.	Length of Life.	Moths.	Length of Life.	Moths.	Length of Life.	Moths.
Days.	No.	Days.	No.	Days.	No.	Days.	No.	Days.	No.	Days.	No.
5	2	5	...	18	11	18	16	31	2	31	4
6	2	6	..	19	12	19	14	32	2	32	2
7	3	7	3	20	11	20	17	33	...	33	3
8	4	8	3	21	14	21	13	34	1	34	1
9	5	9	1	22	10	22	11	35	...	35	..
10	4	10	1	23	17	23	8	36	1	36	1
11	4	11	9	24	4	24	5	37	1	37	...
12	13	12	4	25	9	25	5	38	...	38	1
13	13	13	10	26	2	26	10	39	1	39	
14	18	14	14	27	3	27	5	40	...	40	
15	13	15	13	28	4	28	3	41	1	41	
16	15	16	9	29	3	29	3				
17	9	17	10	30	3	30	2	Total ...	217	Total	201

Average length of life of male moths, 18·32 days; female moths, 19 18 days.
Maximum length of life of male moths, 41 days; female moths, 38 days.
Minimum length of life of male moths, 5 days; female moths, 7 days.

THE FIRST GENERATION.

Eggs of the First Brood.

Time of egg deposition.—The first eggs were deposited on 29th September, and the last on 26th December. The maximum egg deposition occurred on 4th December, when 276 eggs were laid. On two occasions, 3rd, 4th, and 5th November, and 17th and 18th November, very cold weather was experienced and no eggs weie deposited. On 6th December another cold snap occurred and only five eggs were deposited. Detailed observations of the hours of oviposition indicated that the majority of eggs were deposited between 3 and 6 p.m., and that very low temperatures prevented deposition. The average daily temperature for the period 2 to 8 p.m. is given in Fig. 3. The critical temperature indicated in the observations was approximately 60 deg. Fah. The average temperature for the period 2 till 8 p.m. on 6th December was 57·75 deg. Fah., with a maximum temperature of 61·5 deg. Fah. at approximately 5 p.m., and it is possible that the five eggs were deposited at this time. Fig. 3 shows the time of deposition of eggs of the first brood and the influence of temperature on deposition.

Length of incubation.—The length of incubation was markedly influenced by temperature, varying from a maximum of thirteen days to a minimum of seven days. The maximum period of thirteen days occurred towards the

end of December and was due to a recurrence of cold weather. The shortening of the period of incubation and its subsequent lengthening is illustrated in Table 4. The average length of incubation was 10·03 days.

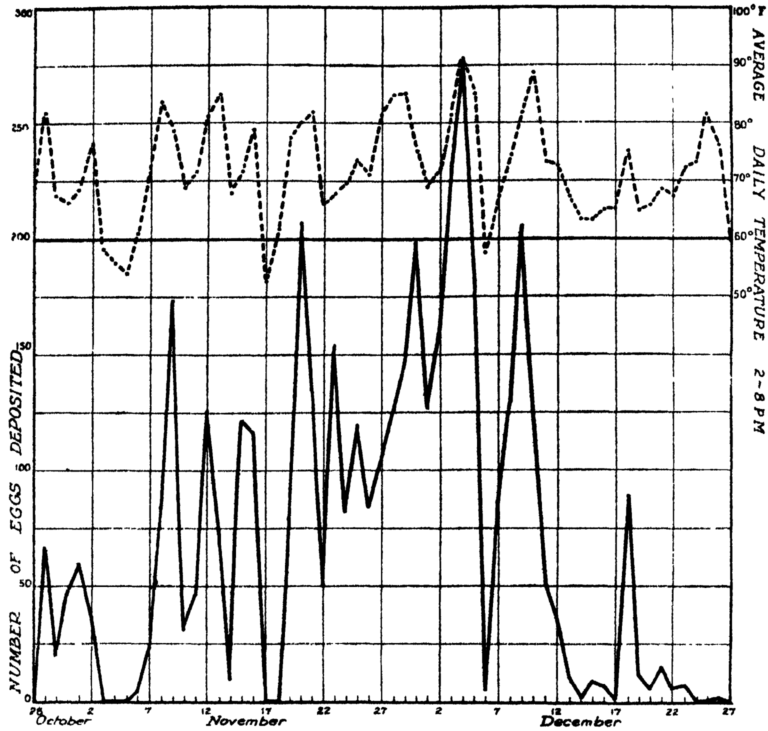


Fig. 3.—Time of Deposition of Eggs of the First Brood at Bathurst.

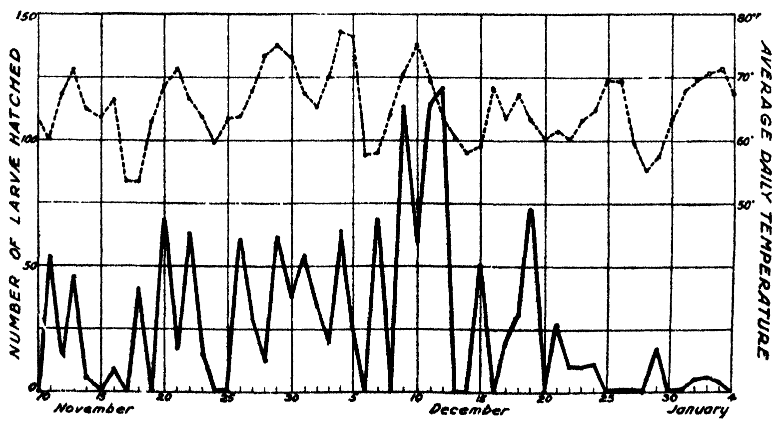


Fig. 4.—Hatching of Larvæ of the First Brood at Bathurst.

TABLE 4.—Time of deposition and length of incubation of eggs of the first brood at Bathurst.

Date of Deposition.	Number of Eggs.	Number of days from deposition to appearance of—						Incubation period in days.		
		Red Ring.			Black Spot.					
		Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
29 October	55	4·00	4	4	11·00	11	11	12·00	12	12
31 ,,	14	4·00	4	4	11·00	11	11	12·00	12	12
1 November ...	48	4·00	4	4	11·00	11	11	12·00	12	12
2 ,,	7	7·00	7	7	11·00	11	11	12·00	12	12
7 ,,	9	4·00	4	4	8·00	8	8	9·00	9	9
8 ,, ...	46	3·00	3	3	8·00	8	8	10·00	10	10
9 ,,	68	4·00	4	4	10·00	10	10	11·00	11	11
10 ,,	9	5·00	5	5	9·00	9	9	11·00	11	11
11 ,, ...	9	7·00	7	7	9·00	9	9	10·00	10	10
12 ,, ...	68	4·50	6	3	9·00	9	9	10·00	10	10
13 ,, ...	16	5·00	5	5	9·00	9	9	10·00	10	10
14 ,, ...	1	3·00	3	3	9·00	9	9	11·00	11	11
15 ,, ...	63	4·00	4	4	9·00	9	9	11·00	11	11
16 ,, ...	29	4·00	4	4	9·00	9	9	11·00	11	11
19 ,, ...	13	6·00	6	6	8·00	8	8	9·00	9	9
20 ,, ...	62	3·00	3	3	8·00	8	8	9·00	9	9
21 ,, ...	38	4·00	4	4	8·00	8	8	9·00	9	9
23 ,, ...	37	5·00	5	5	7·00	7	7	8·00	8	8
24 ,, ...	17	2·00	2	2	6·00	6	6	7·00	7	7
25 ,, ...	34	3·00	3	3	6·00	6	6	7·00	7	7
26 ,, ...	20	3·00	3	3	6·00	6	6	7·00	7	7
27 ,, ...	64	2·00	2	2	6·00	6	6	7·00	7	7
28 ,, ...	26	2·00	2	2	6·00	6	6	7·00	7	7
29 ,, ...	68	2·00	2	2	7·00	7	7	8·00	8	8
30 ,, ...	47	3·00	3	3	7·00	7	7	9·00	9	9
1 December ...	69	3·00	3	3	7·00	7	7	8·00	8	8
2 ,, ...	60	2·00	2	2	7·00	7	7	8·00	8	8
3 ,, ...	114	4·00	4	4	7·00	7	7	8·00	8	8
4 ,, ...	121	3·00	3	3	7·00	7	7	8·00	8	8
5 ,, ...	50	6·00	6	6	8·00	8	8	10·00	10	10
7 ,, ...	20	3·00	3	3	7·00	7	7	10·00	10	10
8 ,, ...	33	3·00	3	3	8·00	8	8	10·00	10	10
9 ,, ...	78	2·00	2	2	9·00	9	9	10·00	10	10
10 ,, ...	38	4·00	4	4	10·00	10	10	11·75	12	11
11 ,, ...	11	5·00	5	5	10·00	10	10	12·00	12	12
12 ,, ...	12	5·00	5	5	11·00	11	11	12·00	12	12
13 ,, ...	5	5·00	5	5	11·00	11	11	13·00	13	13
15 ,, ...	2	4·00	4	4	...	..	..	..	..	...
16 ,, ...	1	...	...	...	10·00	10	10	11·00	11	11
18 ,, ...	18	8·00	8	8	9·00	9	9	11·00	11	11
19 ,, ...	4	7·00	7	7	11·00	11	11	12·75	13	12
20 ,, ...	2	4·00	4	4	10·00	10	10	13·00	13	13
21 ,, ...	2	5·00	5	5	10·00	10	10	12·00	12	12
22 ,, ...	1	5·00	5	5	10·00	10	10	11·00	11	11
23 ,, ...	5	6·00	6	6	9·80	10	9	10·80	11	10
	1,524	4·13	8	2	8·63	11	6	10·03	13	7

Larvæ of the First Brood.

Time of hatching.—The first brood larvæ commenced hatching on 11th November and continued until 3rd January, with a maximum hatching on 12th December. Numerous breaks occur in Fig. 4 in the graph, illustrating the hatching of first brood larvæ, and these are due to exceptionally cold spells, either preventing oviposition by the spring brood of moths or delaying the hatching of the eggs under observation.

Length of feeding period.—The feeding period of 140 individuals indicated that the average was 29·14 days, with a maximum period of forty days and a minimum period of eighteen days. This information is given in Table 5.

TABLE 5.—Length of the feeding period of the first brood at Bathurst.

Date of entering fruit.	Number of larvæ.	Feeding period in days.			Date of entering fruit.	Number of larvæ.	Feeding period in days.			Date of entering fruit.	Number of larvæ.	Feeding period in days.		
		Average.	Maximum	Minimum			Average.	Maximum	Minimum			Average	Maximum	Minimum.
10 Nov.	6	29·00	38	28	26 Nov...	7	29·14	36	24	11 Dec. .	3	35·00	37	33
12 „ ..	4	27·50	37	23	27 „ ..	4	31·25	37	28	12 „ ..	10	32·70	38	29
13 „	10	25·40	29	18	28 „ ..	4	31·00	35	28	13 „ .	12	30·67	33	28
14 „ .	5	28·00	35	22	29 „ ..	5	30·60	34	28	17 „	2	29·50	32	27
18 „	10	28·00	36	24	30 „ ..	2	29·00	31	27	18 „ .	6	27·50	29	27
20 „	10	28·40	32	23	2 Dec. .	2	28·00	28	28	22 „	7	25·29	27	24
21 „ ..	2	27·00	31	23	7 „ ..	3	30·00	33	27	23 „	1	25·00	25	25
22 „ ...	11	29·19	40	23	9 „ ..	7	33·14	36	29	26 „ .	3	24·00	26	22
23 „ .	1	26·00	26	26	10 „ .	3	32·00	33	30					

Total number of larvæ	140
Average length of feeding period in days	29·14
Maximum length of feeding period in days	40
Minimum length of feeding period in days	18

Length of cocooning period.—The average cocooning period of 118 transforming larvæ was 7·22 days, with a maximum of forty-three days and a minimum period of three days. This period represents the time between leaving the fruit and the pupation of the larvæ (see Table 6).

TABLE 6.—Length of cocooning period of transforming larvæ of the first brood at Bathurst.

Date of leaving fruit.	Number of larvæ.	Cocooning period in days.			Date of leaving fruit.	Number of larvæ.	Cocooning period in days.			Date of leaving fruit.	Number of larvæ.	Cocooning period in days.		
		Average	Maximum	Minimum.			Average.	Maximum	Minimum			Average	Maximum.	Minimum
5 Dec...	2	7·00	7	7	20 Dec...	3	11·00	14	5	9 Jan.	3	5·67	6	5
6 „ ..	2	6·00	7	5	22 „ ..	2	8·50	9	8	10 „ .	2	5·00	6	4
7 „ .	1	4·00	4	4	23 „ ..	2	8·00	8	8	11 „ .	3	4·67	6	4
8 „ .	5	12·40	43	3	25 „ ..	3	9·33	14	7	12 „ ..	5	3·80	4	3
9 „ ..	3	5·00	6	4	26 „	2	17·50	20	15	13	7	5·29	13	3
10 „ ...	3	5·33	6	5	27 „ .	4	11·25	23	7	14 „ .	9	4·67	8	3
12 „ ..	5	7·20	9	6	28 „	1	7·00	7	7	15 „	8	4·63	6	4
13 „ .	3	19·33	26	9	29 „ ..	1	8·00	8	8	16 „	4	5·25	8	4
14 „ .	3	15·67	32	6	30 „ .	4	5·75	7	5	17 „ .	6	5·50	7	4
15 „ .	3	6·67	8	6	31 „ ..	1	13·00	13	13	18 „ ..	2	7·00	8	6
16 „ .	1	37·00	37	37	1 Jan ..	2	7·00	10	4	19 „	2	10·00	14	6
17 „ .	2	8·00	9	7	2	1	11·00	11	11					
18 „ ..	1	29·00	29	29	3 .. .	2	8·00	9	7	Total	118	7·22	43	3
19 „	4	12·50	29	6	7 . ..	1	7·00	7	7					

(*To be concluded.*)

CULL OUT UNPROFITABLE TREES.

EVERY tree that is planted in an orchard is put there for a definite purpose—to yield each year an amount of fruit that will return not only the cost of its upkeep and interest on capital, but a margin of profit for the grower. Unless each tree will do this it should not have a place in the orchard. A fruitgrower who keeps a non-profitable tree in his orchard can be compared with a dairyman who keeps a dry cow all the year around.—J. M. WARD, in the Victorian *Journal of Agriculture.*

Co-operative Fruit Packing Houses.

Their Requirements and Problems.

(Concluded from page 565.)

R. J. BENTON and W. H. BROWN.

Smaller Packing Sheds.

Though our present subject is co-operative sheds and the factors that may militate against their success, it is perhaps appropriate to remark that many growers are too isolated to be able to unite with others in co-operative packing, but there is no reason why their sheds should not be so constructed as to minimise labour and save time. Two or three of the accompanying illustrations relate to that class of shed and go to show that the general principles for the lay-out of a larger shed should, in the main, apply in such cases. With a little planning and arranging the sizing machine and other parts of the plant can be made to facilitate the expeditious and economical production of a pack that will command attention on any market.

A grower's shed is frequently arranged with the sizing machine so fixed that it can be fed from a bin placed where the lorry or cart from the orchard can deposit its load close alongside. Such sheds are illustrated on pages 634 and 635. Up to 100 cases per day can be packed under such conditions, the fruit being fed to the sizer through the back of the shed per medium of a bin that can just be seen through the opening on the left hand side of the illustration on page 634. In such a case facilities for grading for quality are not so essential as in a large co-operative shed, for the fruit is usually less variable than in a large shed. Grading for quality can be most easily done when the fruit is being picked or on a table.

A Small Co-operative Shed.

The possibilities of small sheds capable of handling the product of two or three or even half a dozen growers, have yet to be realised, but they are suggested by the arrangement under which a shed, owned by Mr. W. Barrett, and located at Dooralong, four or five miles from Wyong, is run co-operatively by four or five growers. The little valley contains a group of orchards with very similar conditions, producing fruit of uniform quality, and the shed was erected by Mr. Barrett, some years ago, with the dual object of preserving the reputation of Dooralong for sound, attractive fruit, and of keeping the money expended on proper packing in the district. The cases are procured in shooks from a local mill, and the whole of the labour is provided by those who are in the group. The shed is equipped with a mechanical sizer, and is capable of an output of 100 to 120 cases per day, the season's total being 4,500 to 5,000 cases. Being grown under quite similar soil and climatic conditions the fruit is remarkably uniform in quality,

and after any fruit that is below grade or too small has been classed out, it is usually possible to market 90 to 95 per cent. as choicest. The fruit is pooled and is sold under the shed brand, and accounts are adjusted monthly. The actual packing is done by Mr. W. Barrett, junior, who also manages the business and keeps the books, and he is paid for the packing at piece rates with a salary for the time spent on management. Under these conditions the shed is most economically conducted, and in the season 1926, when something like 4,500 cases were handled, a charge of 9d. per case was made for working expenses, packing, paper linings, labels, insurances, postages, &c., and at the end of the season 1¾d. per case (3½d. per 100 lb.) was returned to the suppliers.

There must be numbers of districts in this State which present similar reasons for a few growers getting together and pooling their fruit, packing it on commercial lines, and placing it on the market under one brand. That such methods are more economical than individual packing is obvious, while the advantages of a substantial quantity of fruit—known to be uniform in quality—reaching the market as the product of one district are certain to operate to profit. Large sheds have inevitably to deal with the product of a variety of soil and atmospheric conditions, but such a shed as we have described escapes those differences, and the "pack" must surely be acceptable on the market.

A Prime Essential to Success.

Returning to the factors that have contributed to the failure of the larger co-operative sheds, it has to be recalled that many growers have failed to support their local institutions as they should, and even shareholders have been, and are, guilty of marketing their fruit through other channels. The folly of the practice should be self-evident, for every parcel put through the shed is a factor in the reduction of cost per case.

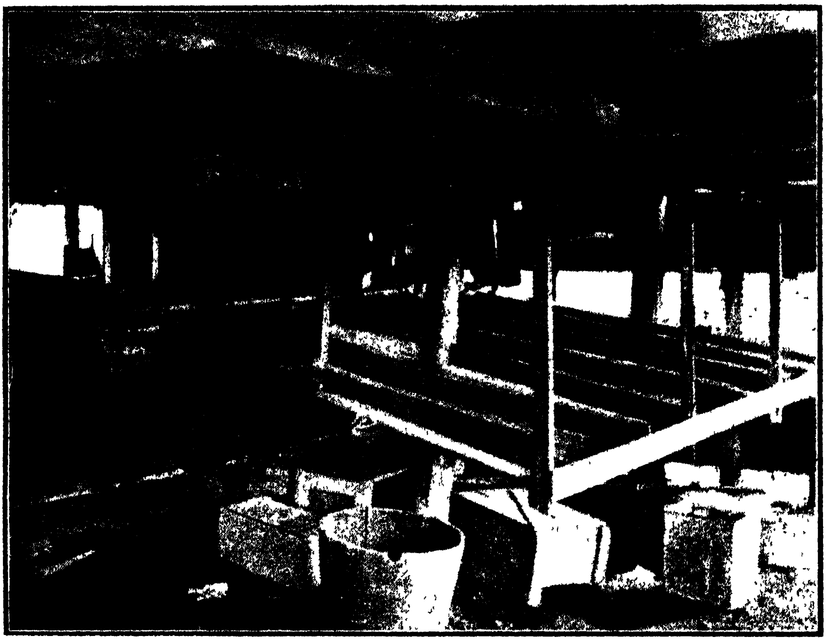
As stated early in this article, small and inferior fruit may just as well be marketed through some other channel, for it is not worth expending labour on—though, indeed, many a time has it happened that the shed has made a better return even on such lines than private agents.

But what of the parcels of good fruit that do not pass through the shed? The ease with which shareholders (and local growers who are not shareholders) are tempted away to other means of marketing their product proclaims that they do not appreciate either the need for combination or its advantages. The very essence of co-operation in the initial stages of any venture is a capacity to see an advantage that may not be immediate, but that is not the less real. So soon as that ultimate advantage is lost sight of, and some immediate advantage captivates the eye, there enters a factor that undermines the whole objective.

Admittedly the competition with co-operative concerns is keen, and the spirit of disloyalty is fed from other sources, but it is for the co-operator to keep his goal well in view. Alluring offers may be made for certain consignments, or particularly gratifying returns may be forwarded at times, but co-operation is a principle worth making sacrifices for in the confidence of

ultimate success. It may be that the co-operative shed is beaten sometimes—the manager of one shed last year admitted that occurred—but he added "in the great bulk of cases we win; the consistent supporter of the co-operative shed knows that that is true."

The reasons for failure to support the co-operative concern make an interesting study. No doubt, in the first case, there is a good deal of ignorance about the prices the sheds actually obtain for their shareholders. One grower near Wyong last year proclaimed he had got 10s. per case through some private channel for navel oranges. To him the return seemed a particularly satisfactory one, and he quoted the figure rather boastingly. Yet at that very time the local shed was obtaining nearly double for the same



Interior of Mr. W. Holcomb's Packing Shed at Narara.
Capable of packing 100 cases per day.

quality. In another case a grower received a net return privately of fourpence per case for Parramattas. It was not much, and the next consignment he put through the shed, which returned him a clear 2s. 5d. One would have expected him to become a consistent supporter of the co-operative enterprise—a city business man would certainly have done so—but somehow even such an argument failed to convince this grower, for he remained outside the shed.

One is almost tempted to think that self-delusion must be a factor sometimes in the continued support of fruit agents. One grower boasted that he got 2s. to 3s. per case for certain lemons. A shed advocate pressed him to be exact, and he admitted that the net figure was really 1s. 9d.! At that time

the shed was actually netting its suppliers over double the amount named. In another case a grower represented that he had beaten the shed price by 10d. per case, but later admitted that he had sold the cases, too—as these had cost him 1s. 10d., the shed had really beaten him by 1s. In a third case a grower handed over the whole of his account sales for one season—over 3,000 cases—permitting a representative of the co-operative shed to work out his actual returns and to compare them month by month with the shed's figures over the same period. The examination proved that the shed had actually paid a better net price over the whole season, notwithstanding the charges imposed for grading and packing.

Failure to appreciate the commercial value of proper grading and packing is another factor that operates against co-operative marketing. That these services add to the market value of fruit there is not the slightest doubt, but many a grower is staggered when he sees the deduction made for the work,

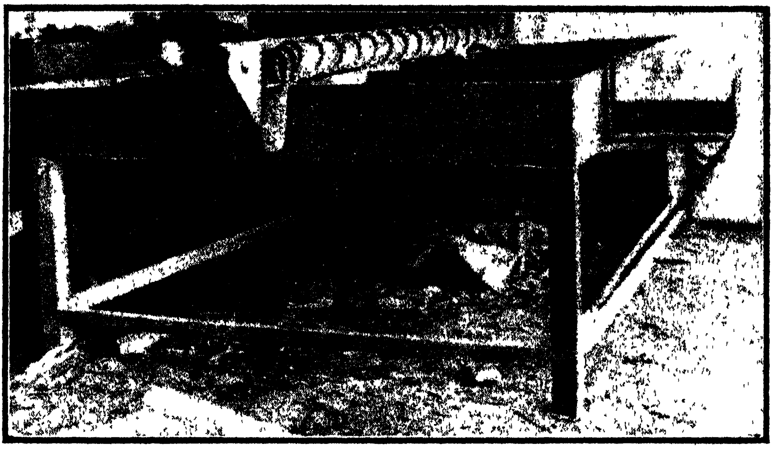
Mr. E. A. Neil's Shed, "Pomona," Uralla.
As a private shed this is particularly well arranged and equipped.

and his wife, looking over his shoulder, offers to pack the fruit herself if he will give her half the amount monthly. The logic seems undeniable, and the bargain is made; but who can question that the work is of a lower standard and has to be done over again in Sydney—a fact the account sales do not disclose. Moreover, the grower himself spends time getting the consignment away, which he could well have devoted to the care of his trees in view of a larger crop and better fruit next season.

What Growers say about Co-operative Marketing.

From these rather negative forms of argument we may turn to the more positive one that those who consistently support the co-operative enterprises are well satisfied with the results and exhibit no disposition to break away. Some of these, no doubt, handle large crops, and are well pleased to be quit of the whole business of packing and marketing. "They can afford to pay

for the service," it will be urged, but the fact that they do so, having the money and turnover to justify them handling the job themselves, is surely proof that the logic of £ s. d. is convincing. Expressions of opinion were obtained lately from several growers who market through the Gosford shed, and there was not a moment's hesitation in their attitude on the subject. Mr. F. Duffy, who has been a grower for forty years, believed "the shed is the proper way to market the crop; the prices from the shed are as good as from the agents, and there is a lot less trouble." Mr. T. R. Coulson (President of the Committee of Management) remarked that "organisation is essential owing to the increase in the area under citrus." While an advocate of a board for the advancement of the interests of co-operative sheds, he plainly intimated that "we don't want Government interference." Cultural experiments should be carried out by the Department of Agriculture, of course, but the marketing of their crop growers would prefer to do themselves.



**A Home-made Sizing machine.
Economical, but doubtless quite efficient.**

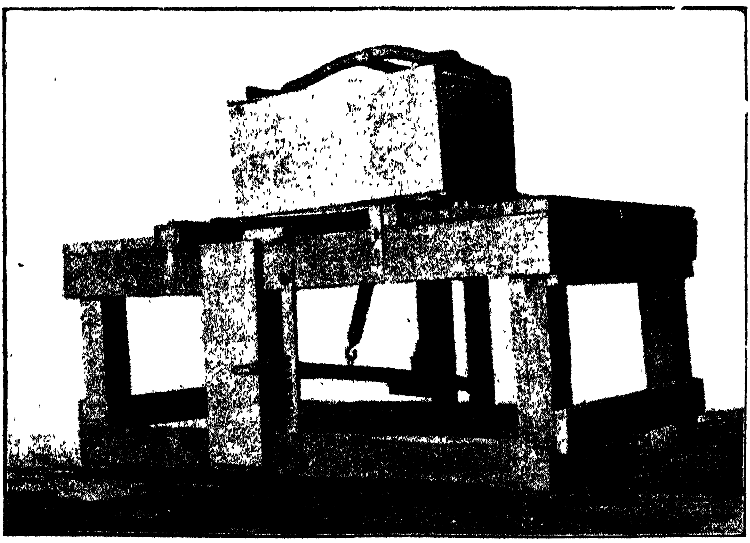
Mr. C. A. Arnott remarked that "the complaints chiefly came from men who grow fruit of indifferent quality. On a return of 10s. or 12s. per case the packing charge of 1s. 5d. does not look much, but if the fruit only returns 4s. per case the shed charges look a big item. The charges have to be paid just the same when such a line is marketed through the agents, but the grower does not see it on his account sales, and does not worry so much about it." Mr. Arnott added that though the patrons of the shed sometimes sent parcels of fruit away to agents, those were usually the inferior grades, on which the shed charges seemed heavy. "Gosford shareholders are really loyal, which proves that they are fairly well satisfied. Up to date the shed has satisfied the growers of good fruit, and they have got good prices, so that the handling charges have not been felt so severely."

Contrast such statements as these with the fact that one small shed with some sixty shareholders has in the past season or two only had about twenty-five consistent supporters, and some idea is gathered of the extent to which

disloyalty goes and how assuredly it undermines the practice of co-operation. The said small shed is as capable of an economical output as any, but it is located in a district where conservatism seems strongly entrenched, and the city agent holds sway.

A Nailing-down Press of Modern Type.

The case is gripped at both ends above and below so that both top and bottom boards "spring."



The Press with Case in Position.

Note the foot lever with which the lids are clamped on.

Notwithstanding the checks which the smaller co-operative sheds suffered a few years back, however, it is certain that necessity will yet compel producers to come together, and growers who wait for others to blaze the track (perhaps they think to pave the way) are only delaying a development that is in their own commercial interests. The shed system will increase in efficiency, and an increasing number of growers will come in, and as they do so possibilities of further development will come to light.

One selling floor has been opened in Sydney, where the co-operative sheds can offer their lines direct to retailers. So far it has only had the support of certain citrus sheds and of the Batlow concern with its apples and pears, but it is hoped that it will develop quite soon, and that other depots will become possible, enabling direct contact between the packing shed and the retailer.

One of the features of the system of co-operative marketing on standardised lines is the reputation gradually built up on the market for the brand. The brands of the Gosford and Batlow sheds, for instance, now signify a definite thing on the markets, and the smaller sheds are in the same position, though perhaps less conspicuous. The opportunities for the development of new markets under such circumstances are obvious, and are certain to work out to the advantage of growers.

Yet another direction in which co-ordinate effort will assist the industry will be the elimination of unprofitable varieties and classes of fruit. Among apple-growers there will be the cutting out of many of the less-known varieties which are seldom sold to consumers under their own names, while among citrus-growers there will be the conversion of many trees from the common orange to more profitable sorts. It may be true that the Californians can get their customers to eat well-advertised lines at any time in the year, but Australians are not easily induced to eat oranges in winter, even at the prices at which the common orange is often offered. The organisation of the growers in this respect is likely to come in the not distant future.

Thus the prospects and the opportunities for co-operative activity are increasing. Already something has been accomplished in the modification which the ideas of many have undergone in relation to the value of the commercial pack, and this in itself is clearing the way for further developments.

INFECTIOUS DISEASES REPORTED IN JUNE.

THE following outbreaks of the more important infectious diseases were reported during the month of June, 1927:—

Anthrax	Nil.
Pleuro-pneumonia contagiosa	4
Piroplasmosis (tick fever)	Nil.
Blackleg	3
Swine fever	Nil.

—MAX HENRY, Chief Veterinary Surgeon.

The Propagation of Vines.

GERALD W. BEVERLEY, Senior Fruit Instructor.

THE difficulty of obtaining regular and consistent crops of grapes can often be attributed to the source from whence the vines were originally obtained.

The fact that on the Irrigation Areas in the past season, vines that were originally taken from selected vines as cuttings, and planted in the place in which it was intended to establish them permanently, have given the highest yields on record, goes to prove very conclusively that the selection of cuttings from heavy bearing parent vines is a necessity. The cutting should be made only when the wood is well ripened (about July or early August), and only one cutting should be selected from each cane, while the cutting should be short jointed and have clean hard wood without the dark " pithy core " which is often so much in evidence in vines grown under irrigation conditions. Very often the making of cuttings from unripe wood, either too early in the season, or too late (when the sap is rising), has been the cause of an unsuccessful strike. Cuttings should be planted as carefully as rooted vines, and although some people have had a reasonable amount of success by drilling a hole with a crowbar and inserting the cutting, it is a crude and unreliable method of planting.

A Proper Method of Planting.

To plant a cutting properly in its permanent position a hole should be dug to a depth of about 12 inches if possible, but so as to avoid digging into the subsoil. A cutting about 12 inches in length, containing about eight eyes, should be planted with a slight bend at the end of the cutting in the hole (see Fig. 1). The soil should be well tramped down to exclude the air, and the cutting should be completely covered with loose soil so as to protect the top buds from any danger of frost.

When the vine commences to sprout in spring the shoots will force their way through the loose soil, and after they are strong enough can be thinned out to two or three canes. It is always advisable to leave more than one cane, as they encourage root growth and allow for a shoot being blown off by the strong winds which prevail here on the Area during October.

The advantage obtained by thus planting cuttings (particularly of vines and figs) is that the callousing at the end of the cutting from which the young rootlets spring, is never disturbed, and in consequence the threadlike rootlets penetrate the soil and make their way through fine cracks in the subsoil, and as they grow they expand the soil and penetrate deeper than if planted as rooted vines. When a vine is planted as a year-old rootling, the roots (which are often strong and vigorous) are usually cut back to a length of 2 to 3 inches, and this forms a crown underground which however long the vine

lasts, remains at the depth of the original planting—thickening out year after year certainly, but without the tendency to throw out deep roots like the cutting.

Moreover, the root growth so cut away when transplanting a rootling, is all saved if the cutting is planted in its permanent position, and the plant itself, therefore, is not subjected to any check by loss of part of its root system.

A very strong point in the favour of planting cuttings is that a grower can select the stock from heavy bearing vines, because he knows their record for probably several seasons. On the other hand if rooted vines are purchased from outside sources there is no guarantee where the cuttings were taken from. Very often the wood is from strong growing vines from which every available piece of wood is made into cuttings, with the result that the wood is often immature and sappy. The plant so obtained is a strong growing vine with the characteristics of the parent vine, making a heavy growth, but little or no fruit.

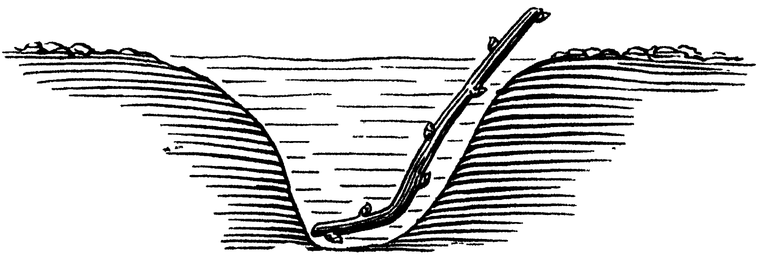


Fig. 1.—The Correct Way to Plant a Cutting.

I have seen cases of this in various settlements, and have proved conclusively to my own satisfaction that the selected cutting will in a few years overtake the rooted vine in both bearing and other qualities. I have also seen cases where rods, 10 to 12 feet in length, have had the entire length made up into cuttings. One man at least has told me that he planted cuttings from vines which in turn had themselves only been planted as rootlings the previous season. Under such circumstances, how can one expect to establish a heavy bearing vineyard ?

Selection of the cuttings is as important a feature in establishing a vineyard as bud selection in establishing an orange grove, or, indeed, an orchard of any kind. Nothing but the best should be selected and planted, otherwise the result is never satisfactory as regards good and consistent crops.

The land in which cuttings are to be planted should have been previously deeply ploughed, and well worked up to a good tilth.

The long twisted cutting illustrated in Fig. 2 is rather a useful type of cutting to plant where misses have occurred or where it is desirable to establish a very strong vine. I have known this type of cutting strike with

great success where other cuttings have failed. The twisting of the cane into a loop checks the sap and causes a strong break out of rootlets at every eye on the cane, thus giving a very strong establishment of root growth.

Layering the Vine.

It is often very difficult to establish young vines among a patch of older ones where many misses have occurred in the early stages of planting. The best way to fill in misses among an old established vineyard is by propagating from layers. I have often seen this method very incorrectly performed, and a few hints as to the correct method of layering a vine may be offered.

The cane which it is intended to layer should be selected as near the stem of the vine as possible, so as to obtain the greatest vigor from the parent stock. A trench about 10 to 12 inches deep should be dug to where it is in-

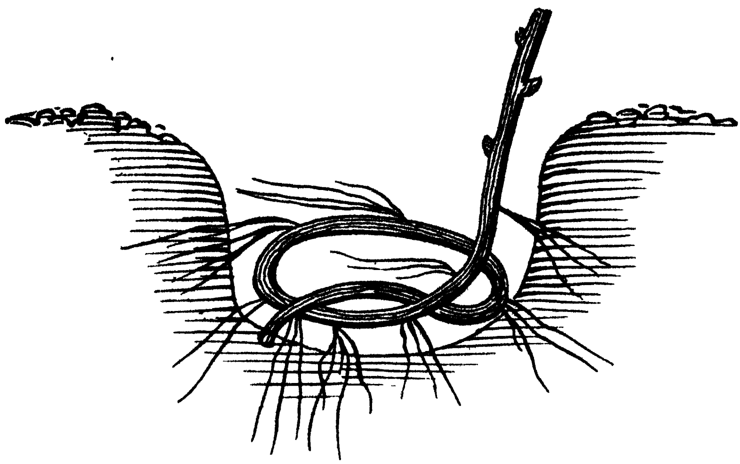


Fig. 2.—How a Long Cutting may be Planted.
This method makes a particularly strong root growth.

tended to plant the "miss," and the cane should be bent down and laid along the bottom of this trench until it reaches the spot where it is desired the vine shall be (Fig. 3). If the cane is a very strong and vigorous one, the end may be taken up to the wire where it is intended to form the permanent crown of the new vine, but if there is any sign of weakness, then the cane should be cut back so as to leave only two eyes above the ground.

It will be noticed that in the figure the layer is shown placed underground. The advantage of this method is obvious, as every eye on the rod sends out roots and the layer becomes a strong bearing vine in two years. The question has often been asked, "Will not the cane send up suckers from underground"? The answer is, I have never known a layer to do this, as the sap flow runs to the end buds, and sends up strong growth from the portion left above ground. All growth should be rubbed off from the portion of the layer growing downwards from the parent vine (marked *a*———*b*, in Fig. 3).

In Fig 4 is shown a cane taken from the end of the arm and run along the wire until the vacant spot is reached, and then "dipped" down and planted in the ground. This is the manner of layering which I have generally found in use, but it is quite wrong, for the following reasons:—

The layer, instead of being fed by the parent vine, is actually deprived of sap by the development of new growth and fruit all along the cane, with the result that the layer can only depend upon the small portion that has been put underground to root. Under these conditions the layer either fails entirely or makes very poor root growth.

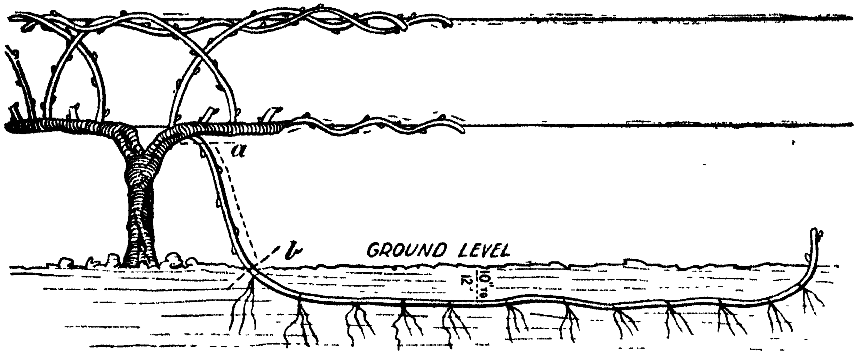


Fig. 3.—A Properly Layered Vine.

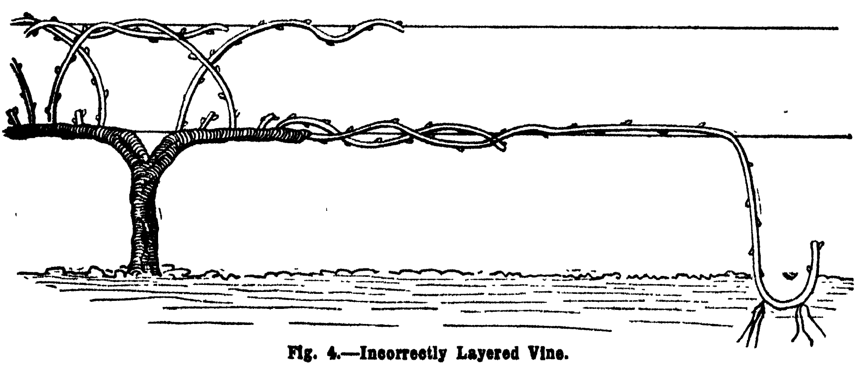


Fig. 4.—Incorrectly Layered Vine.

I have found many cases where layers were put down as in Fig. 4, with unsatisfactory results, and I have advised the growers to dig up the layer, uncoil the cane from the wire, cut back all shoots on the cane to a base bud and replant the whole length in a trench at once, according to Fig. 3. Any roots that the end of the layer may have made should also be cut back before

replanting. If this method is followed, the result will well repay any trouble incurred, as roots will be thrown out from every pruned back eye and a strong vine will be established.

Another great advantage of the first method of layering (Fig. 3) is that it is not necessary to sever the layer from the parent vine so long as it shows no sign of weakness, and heavier crops can be obtained from both parent vine and layer, by leaving them unsevered. I know of one sultana vine which I layered in 1909 that covers a long overhead trellis, and which has yielded as high as 47 lb. dried weight of sultanas from parent vine and unsevered layer. This vine was planted as a cutting in 1889, on Seal's block at Mildura, and it is still yielding heavy crops every year, although the soil is not particularly good and is decidedly salty.

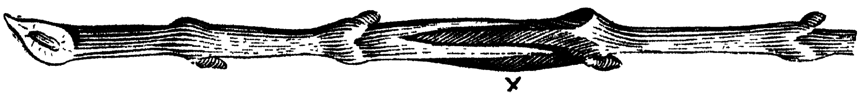


Fig. 5.—The Tongue Graft can be used to join Cuttings.
This method is useful where the cane is not long enough for a cutting, and also in establishing layers of a different variety.

In Case of "Misses."

At the time of planting out the main lot, a few hundred cuttings may also be laid down in a pit to "sweat" and callous up, and in the spring, as soon as it can be seen that any of the cuttings have failed, their places can be filled in at once from the reserve. By these means a full strike is assured in one season.

To "sweat" the cuttings, they should be tied up in bundles of from 50 to 100, and laid horizontally in a trench and covered over with at least 9 inches of soil. If such cuttings are placed in a trench or pit in a perpendicular way, the air is far more likely to get into the bundles, and to cause the cuttings to dry out.

If care is taken, however, with the planting out in the first place, there should be few if any misses to replace, and in three years, the cuttings will make far better and more consistent bearers than rooted vines, and will establish themselves more deeply in the soil. This also applies very particularly to figs. I have planted the two side by side and have noted the results.

It is a mistake to give cuttings too much water during the first few months as the young and tender rootlets are often destroyed if water lies on them for any length of time.

If there is a good strike and the cuttings all show signs of growing well, water them as lightly as possible—just sufficient to keep them growing well without any check—for then the young roots will penetrate the soil seeking moisture, and will establish themselves far better than if constantly swamped with water. Always work up the soil as soon as possible after the water is applied, so that the land does nor cake or harden round the collars of the vines.

If the above methods are adopted, it will be possible to fill in all the gaps in a vineyard, and to make the whole planted area profitable, whereas if misses are allowed to remain year after year the average tonnage per acre is reduced, and often a grower is disappointed with his tonnage per acre because he does not take into consideration the amount lost by blank spaces.

Further Hints.

It will sometimes be found that a vine has not made sufficient growth to allow of the cane reaching the vacant spot where it is desired to plant the layer. If this is the case, choose a strong, short jointed cane from another vine, and cutting the other cane back, so as to get an even thickness in the two canes, tongue graft the two together, binding them with a piece of twine or a waxed strip of cloth, as shown in Fig. 5. In this way it is possible to take a layer from one vine to fill in a vacant space to almost any desired length, as even two or three pieces can be grafted together, and if buried in a trench as shown in Fig. 3, the spliced cane will carry the sap and establish itself by rooting out from the eyes as previously shown.

This is a particularly suitable method to apply when layering vines of two different varieties, such as planting sultanas or other kinds among Doradillos or Gordos. One can establish a vineyard of another variety, while still obtaining crops from the vines that will ultimately be uprooted, the undesirable variety being made meantime to feed the newly planted layer until it is well established on its own roots.

This applies more to varieties other than Ohanez (or Daria), which often does far better if given greater rooting room and a higher trellis. In any further plantings of this variety I would advise planting them not less than 14 feet apart.

Two Basic Facts in favour of Silage.

The beauty of silo conservation is that you can store an enormously greater quantity of fodder in the same space than is possible with a hay stack, and you are able to conserve the crop while it is heavy, succulent, and digestible. Further, you are able to take a crop just at the right stage and to put it away. Possibly there are men who will say, "We have a district in which there is no frost, and we can go on cutting each day." I will not listen to them for a moment. When you conserve by means of a silo, you conserve food at a stage when it possesses the highest possible food value. There are men who say that they are able to go out each morning and freshly cut sufficient for the day's needs, but to do so they have to harness a team, collect tools, have a man ready, and cut the fodder each time with a chaff-cutter. They have to go to that trouble each day, and each day that their crop is standing it is going off. Whereas, to fill your silo means that you concentrate for a week or two and the whole operation is done within that time. The two basic facts in favour of silo conservation are that you conserve your crop at the right stage, and you concentrate the work within a matter of a week or two. You have your food supply convenient to your hand, and in a clean and suitable form.—H. J. Bate at the R.A.S. Animal Husbandry Conference.

Increasing the Yield of Citrus Trees.

R. J. BENTON, Senior Fruit Instructor.

For some years it has been noticeable that citrus trees receiving large supplies of farmyard manure, or similar material supplemented with various fertilisers containing more or less nitrogen, phosphoric acid, and potash, have been more consistent in cropping than similar trees not treated so favourably.

At first sight, such increased yield might be regarded as due to the organic matter supplied, but while organic matter is certainly of very great assistance and is necessary, other growers who have not been able to do more than rely on occasional green manure crops with occasional applications of nitrogenous fertilisers are obtaining excellent results also.

The deductions to be made from such experiences appear to be that nitrogen is the main fertiliser required, and is responsible for the increased productivity of the trees. Phosphoric acid and potash may be necessary, but the value of these is certainly not very apparent, and very small applications are sufficient.

Organic matter, however, is essential, for in its absence little benefit can be derived from commercial fertilisers. It may be that in the conversion of organic matter into humus, chemical changes free sufficient phosphoric acid and potash for the requirement of citrus fruits.

During recent years in California, where citrus production has been widely studied as a business, the consensus of opinion of many investigators is expressed in a bulletin by R. W. Hodgson. He states that in Californian experience nitrogen is the only element, and organic matter the only other material which have been demonstrated to give measurable improvements in yield and tree health. He adds that applications of phosphorus and potassium have been made for six years, and no measurable improvement has been noted in certain experiments.

About 200 lb. of nitrogen per acre is the amount recommended for young bearing trees, half of which amount is preferably applied in an organic bulky form, and the remainder in an inorganic or chemical form. For older trees—12 to 20 years old or more—the applications may be increased to 300 lb. of nitrogen per acre.

Such applications of nitrogen will appear tremendously heavy to many growers, especially when it is realised that the following amounts of fertilisers are required to provide 100 lb. only of nitrogen per acre, viz., dried blood, 833 lb.; blood and bone, 2,000 lb.; nitrate of soda, 666 lb.; sulphate of ammonia, 500 lb. Hodgson remarks that it does not appear to matter which of these nitrogenous manures are used. They all appear to give similar results, providing that they are applied in time for the tree's requirements.

Very few, if any, of the growers in this State have used applications so heavy as that stated; but on the Irrigation Area several growers have fertilised with sulphate of ammonia up to 8 lb. per tree, applying the whole in one application late in the winter. At a recent meeting of the Research Bureau, at Griffith, Mr. E. S. West recommended applications up to 8 cwt. per acre for trees up to 12 years old.

Mr. H. J. Braund, of Griffith, has conducted experiments for some years, and his experience is that trees which have been manured thus heavily have produced excellent crops this season, the quality of the fruit being excellent and not in the least inferior to that borne by trees manured with other than nitrogenous fertilisers, while the crops on trees manured with the latter are light.

Mr. W. B. Stokes, in last month's *Agricultural Gazette*, reports on the excellence of the results obtained from nitrogen at Narara. Other instances are also on record where a few trees only treated during the past season or two with nitrate of soda or dried blood, the latter at up to 20 lb. per tree, have given superior results as regards yield and health of trees.

At this time of the season it is particularly opportune to draw attention to the need of manuring, and the recommendation made by the California authorities, supported by the advantages noted amongst several growers on the Murrumbidgee irrigation areas and in our coastal districts, should commend to all growers the practice of increasing the nitrogen supply. Citrus trees will only return a yield in proportion to the amount of plant-food available. On many ochards it would be more economical to apply all the manure possible to half the number of trees. That is, half the trees well fed will produce much more and better quality fruit than the whole lot partially starved.

On the results so far noted trees up to 8 years old growing under average conditions may receive up to 1 lb. of nitrogen, up to 12 years old 2 lb. of nitrogen, and up to 20 years 3 lb. nitrogen. It is desired to again stress the necessity of not omitting organic material—bush scrapings, new soil, farmyard manure, or green manuring, preferably of a nitrogenous nature, in order to reduce the necessity for so much nitrogen in the chemical form.

As to when the fertilisers should be applied, much will depend on the district, soil, and local conditions. Generally speaking, the trees remain in a dormant condition during the winter, but as spring advances a growth is made on which blossom buds develop. Blossoming and fruit setting results. The production of further growth follows, and after that hardening off; further growth and production throughout the summer and autumn ensues until the trees gradually subside into a fruit-maturing and more or less dormant stage through the winter. According to situation and climatic conditions, most growth is usual in the autumn. The reason for this would appear to be very closely related to the supply of plant-food available during the seasons.

Frequent analyses of soils made throughout the year in California revealed that changes in the nitrate content of the soil were continually occurring. Whilst such changes are influenced somewhat by cultural treatments and seasonal conditions, generally speaking the nitrates (which are the only form of nitrogen of use to trees) are lowest in the winter and early spring. As summer advances, the supply is more plentiful, until a maximum is reached in autumn. It will be seen that when citrus trees push forth their growth in the spring, with the blossom buds, a very poor nitrate supply is naturally present to assist the tree. Neither is the supply very plentiful throughout the fruit-setting period, but later on in the autumn it is usually abundant.

It seems obvious, therefore, that if nitrates are not present naturally when the tree is making a heavy demand for them, as is surely the case during blossoming and fruit-setting, a larger proportion of blossoms must be starved off. The best preventive of this will manifestly be an artificial supply of nitrates. The nitrogen fertiliser most prompt in this respect is nitrate of soda, which should be applied immediately prior to bud-bursting. Sulphate of ammonia and dried blood, having each to be converted into nitrates, should be applied at least a month prior to bud-bursting. Green leguminous crops which supply a proportion of nitrogen should be turned under at least six weeks prior to the first bud burst.

As to whether the fertilisers should be put on in one or more applications is dependent on several factors. In some places the rainfall is low and the soil retentive. In such cases one application will probably give as good results as two applications. But in other districts where leaching may be experienced, or where heavy falls of rain are apt to occur, the application should be of greater benefit if distributed in two or three amounts, the first being the heaviest. The second or third applications should be made by December, especially in districts subject to frosts. It is necessary that the growth of trees be well hardened before winter.

Though a certain kind of nitrogenous manure may be found to be especially suitable for particular soils, it will probably be found most advantageous to vary the kind of fertiliser after two or three seasons for a year or two. The nitrogen content of the application, however, should be noted, and the quantity applied should vary in accordance with the source of nitrogen. In other words, if 2 lb. of nitrate nitrogen, supplied in the form of sulphate of ammonia gives good results, and it is decided (in obedience to the need for change occasionally) to use dried blood instead, it will be necessary to apply a greater weight of dried blood than of sulphate of ammonia to afford the same quantity of nitrate nitrogen. Dried blood contains about 12 per cent. nitrogen, and sulphate of ammonia 20 per cent.

For growers who believe that phosphoric acid and potash are necessary to their trees, a good mixture is as follows:—

6 cwt. sulphate of ammonia.
3 cwt. superphosphate.
1½ cwt. sulphate of potash.

This mixture may be applied at the rate of 1 lb. per tree for each year of the tree's age. Thus, a 10-year-old tree would receive 10 lb. of this mixture, which would contain 1.1 lb. nitrogen, .6 lb. phosphoric acid, and .7 lb. potash.

Many growers purchase ready-mixed fertilisers for their citrus crops. Whilst such practice has its advantage, in that small quantities of individual fertilisers are not obtained, and the labour of mixing the ingredients is avoided, it is sure that the method is not an economical one.

When a ready-mixed fertiliser is applied it may prove of benefit to the trees or crop. In all probability, however, the benefit is provided by only one of the ingredients of the fertiliser. What then becomes of the rest of the material? The experiences quoted earlier in this article suggest that the purchase of the unused portions of the ready-mixed fertiliser has been a waste of money. It is therefore strongly recommended that growers should mix their own fertilisers and reserve an evenly grown lot of trees for a fertilising experiment on their own account.

The article, "Manurial and Fertiliser Practice in Citrus Production," by Mr. W. le Gay Brereton, which appeared in the *Agricultural Gazette* of March, 1927, should be read in conjunction with this one.

Summarising, growers are recommended to increase the nitrate content of the soil with the object of improving the production and the quality of citrus fruits. This can be effected by—

1. Providing the best cultural treatment possible at the correct time.
2. Providing an ample supply of humus by applying organic matter and growing green manure crops.
3. Supplementing the nitrate content of the soil by applications of nitrogen as already stated.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1927.

Society and Secretary.	Date.		Society and Secretary.	Date.	
Condobolin (J. M. Cooney) ..	Aug.	16, 17	Canowindra (W. E. Frost) ..	Sept.	20, 21
Illabo (R. Day)	,,	17	Temora (A. D. Ness)	,,	20, 21, 22
Wagga Wagga (F. H. Croaker)..	,,	23, 24, 25	Boorowa (W. Thompson) ..	,,	22, 23
Bogan Gate (J. Egan)	,,	24	Barellan (W. Colville)	,,	28
Parkes (L. S. Seaborn)	,,	30, 31	Hillston (J. Peevers)	,,	30
Grenfell (P. Mylecharne) ..	,,	30, 31	Corowa (H. G. Norton)	,,	30, Oct. 1
Junee (G. W. Scrivener)	,,	30, 31	Ardlethan	Oct.	5
Lake Cargelligo (J. B. Costello).	,,	31	Quandialla (V. Talbot)	,,	5
Ungarie (L. C. Adamson) ..	Sept.	2	Hay (G. C. McCracken)	,,	5, 6
West Wyalong (A. Andrew) ..	,,	6, 7	Narrandera (M. F. Murray) ..	,,	11, 12
Manildra (J. Langley) . ..	,,	6, 7	Ariah Park (M. Collings	,,	12
Young (T. A. Tester)	,,	6, 7, 8	Bribbaree (J. Austin)	,,	12
Gunnedah (M. C. Tweedie) ..	,,	6, 7, 8	Deniliquin (P. Fagan) .. .	,,	18, 19
Forbes (E. A. Austen) . ..	,,	6, 7	Griffith (W. Sellin) . ..	,,	18, 19
Ganmain (C. C. Henderson) ..	,,	13, 14	Millthorpe (W. P. Smith) ..	,,	18, 19
Cowra (E. P. Todhunter) ..	,,	13, 14	Cootamundra (Annual) (W. W. Brunton)	,,	25, 26
Albury (A. G. Young)	,,	13, 14, 15	Lismore (H. Pritchard)	Nov.	16, 17, 18
Barmedman (S. S. Penberthy) ..	,,	14	Albion Park (H. R. Hobart) ..	Dec.	31, Jan. 2
Murrumburrah (W. Worner) ..	,,	20, 21			

1928.

Dapto (E. G. Coghlin)	Jan.	13, 14	Nimmitabel (R. Draper)	Mar.	5 to 8
Cessnock (D. B. McGilvary) ..	Feb.	16, 17, 18	Taree (R. Plummer)	,,	7, 8, 9
Newcastle (E. J. Dann)	,,	21 to 25.	Armidale (A. McArthur)	,,	13 to 16

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Field Peas—	
French Grey	Principal, H.A. College,* Richmond.
Lima	Principal, H.A. College, Richmond.
Potatoes—	
Satisfaction	Hillen and Leckie, "Cherragorang," Taralga.
	J. J. Maloney, jun., Stonequarry-road, Taralga.
Early Manistee	J. Cusack, Stonequarry-road, Taralga.
Factor	K. Bowen, Springside, via Orange.
	W Reddacliff, Milgarra, Tenterfield.
Carman No. 1	Johns Bros., "Strathalbyn," Myrtleville.
Batlow Redsnooth	T. A. Howard, Cottawalla, Crookwell.
	E. M. Herring "Sheen," Batlow.
Maize—	
Early Morn	J. S. Whan, Llangothlin.
Fitzroy...	F. W. Hill, Yarramalong.
Leaming	Manager, Experiment Farm, Grafton.
Grasses—	
Sudan Grass	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Yanco.
	C. Bennett, Forbes-road, Cowra.
Sweet Sorghums—	
Collier	Manager, Experiment Farm, Grafton.
Selection No. 61	Manager, Experiment Farm, Grafton.
Saccaline	Manager, Experiment Farm, Wollongbar.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

The Effect of Environment.

The effect of a marked change of conditions, such as from a hot to a cool climate, from acid to calcareous soils, from plains to hills, &c., is so very great with most domesticated animals and plants that those individuals submitted to it, particularly if they be bred and reared in the changed conditions, develop differently from the original stock, and to such an extent as to be at least as distinct from their ancestors as a different strain, and in some cases as distinct as a different breed. The environmental effect on the development and breeding powers of animals is so great that individuals of the same blood, reared in separated localities, where the natural conditions are unlike, behave in breeding as if there was no blood relationship between them.—W. J. Spafford in the South Australian *Journal of Agriculture*.

Tubercle-free Herds.

Of the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner.	Address.	Breed.	Number tested.	Expiry date of this certification.
Hygienic Dairy Company ...	Glenfield Farm, Casula, Liverpool.	.....	113	15 Aug., 1927.
New England Girls' Grammar School.	Armidale	......	11	15 Oct., 1927.
Lunacy Department ...	Morisset Mental Hospital.	......	16	18 Oct., 1927.
Department of Education ...	May Villa Homes ...	......	6	3 Nov., 1927.
Do do ...	Eastwood Home ...	......	10	3 Nov., 1927.
Do do ...	Hurlstone Agricultural High School.	......	47	4 Nov., 1927.
Lunacy Department ...	Rydalmere Mental Hospital.	......	61	23 Nov., 1927.
A. E. Collins...	Hazelhurst Dairy, Bowral.	......	10	6 Dec., 1927.
Miss Brennan	Arrankamp, Bowral	......	27	7 Dec., 1927.
Lunacy Department ...	Callan Park Mental Hospital.	......	26	15 Dec., 1927.
Department of Education .	Yanco Agricultural High School.	......	26	12 Jan., 1928
A. V. Chaffey	"Lilydale," Glen Innes.	......	15	25 Jan., 1928.
Lunacy Department ...	Kenmore Mental Hospital.	......	99	1 Feb., 1928.
Walaroi College	Orange	......	2	3 Feb., 1928.
Lunacy Department ...	Orange Mental Hospital.	......	3	7 Feb., 1928.
Australian Missionary College.	Cooranbong	......	51	11 Feb., 1928.
Department of Education ...	Gosford Farm Homes	......	18	18 May, 1928.
William Thompson Masonic Schools.	Baulkham Hills ...	......	31	31 May, 1928.
E. P. Perry	Nundorah, Parkville	Guerns'y	30	8 June, 1928.
Walter Burke	Bellefaire Stud Farm, Appin.	Jersey..	38	11 June, 1928.
H. W. Burton Bradley ...	Sherwood Farm, Moorland.	Jersey..	70	16 June, 1928
Department of Education ...	Mittagong Farm Homes.	......	30	22 June, 1928.
Sacred Heart Convent ...	Bowral	......	11	23 June, 1928.
R. Burns	Wilga Glen Dairy, Coonamble.	......	49	23 June, 1928.
Dominican Convent... ...	Moss Vale	.....	4	24 June, 1928.

—Max Henry, Chief Veterinary Surgeon.

Poultry Notes.

AUGUST.

JAMES HADLINGTON, Poultry Expert.

DURING the past few months these notes have been mainly devoted to discussing the economic side of poultry farming. This has been due to a somewhat uneasy feeling about the immediate future of the poultry industry. That feeling still exists, and may become accentuated as the flush season of production is reached. However, sufficient has been said to inform readers of the main facts in the economic position confronting them, and, since a conference has now been called by the Department, those engaged in the industry will have an opportunity to discuss their own problems. Nothing will be lacking on the part of the Department to assist poultry farmers in their battle for better returns for their products. It is therefore proposed to leave these discussions just now, and to return to matters in connection with the work on the farm.

Brooding.

The most important work on the farm at present is the rearing of the young stock. Brooding, which usually occupies the first six to seven weeks of the life of the chicken, is the most critical time. It is during this stage that fully 80 per cent. of chickens are lost, the causes for the most part being so simple that one sometimes wonders at the complex ideas which prevail as to the main causes of the troubles that occur. It is not too much to say that hundreds of poultry farmers every season worry themselves almost to distraction in the endeavour to find out the cause of big losses in chickens. At the first sign of trouble disease is naturally suspected—and, of course, disease there may be, but experience in investigating these troubles, and in the actual rearing of many hundreds of thousands of chickens, has shown that full 90 per cent. of the failures in brooding are not due primarily to disease, but to faulty rearing. This is the last thing the average farmer will admit, but nevertheless it is true.

Factors Mostly Responsible.

The factors mostly responsible for faulty brooding are low temperatures and the crowding of too many chickens together, either of which conditions will bring about all the symptoms described in almost every disease to which chickens are liable. If these facts were more generally recognised, the life of the average poultry farmer, in respect of peace of mind and financial results, would become a bed of roses compared with what it mostly is at present.

Let us then examine some of the main factors in the two items mentioned. Taking low temperatures first, the minimum degree of temperature required has frequently been laid down in these notes and in other

publications issued by the Department, but, in order to continue the present discussion and keep them fresh in the minds of poultry keepers, they may be repeated:—

MINIMUM TEMPERATURES FOR BROODING CHICKENS.

First week	95 to 90 degrees Fah.
Second and third week...	86 to 82 ,,
Fourth and fifth week	82 to 76 ,,

During the sixth week in warm weather and the seventh week in cold weather the chickens can be gradually weaned from artificial warmth. It should be understood that these are the lowest temperatures compatible with safety. Lower temperatures will not keep the chickens from crowding —which is the main function of applied heat. In many brooding arrangements it is found difficult to maintain even the minimum temperatures stipulated above, but it should be mentioned that, so long as the brooder is of such a type as will allow of the chickens withdrawing from an overheated zone, a much higher range of temperature can be allowed; such, for instance, as:—

HIGHER PERMISSIBLE TEMPERATURES.

First week	90 to 100 degrees.
Second and third week	85 to 95 ,,
Fourth and fifth week	75 to 85 ,,

In no case, however, should chickens be confined in these temperatures. In fact, it is a mistake to confine them to the heated portion of the brooding arrangement at all. No design of brooder is perfect unless it allows of the chickens working from the heated portion to a cooler zone, and the latter should not be too cold, particularly for chickens up to a month old. The best arrangement is: (1) the brooder proper; (2) a cool area, say, inside the brooder house; and (3) the outside runs.

Another important point is that at any time chickens are best kept inside the brooder house up to the end of the first week, but particularly so during the cool months. This will save quite a lot of the concentrated attention necessary to keep baby chickens under proper control, because during cold or cloudy days they have a tendency to stay away from their heated compartment, and get chilled.

It might be pointed out that any deductions on the hypothesis that chickens can be brooded without heat or such arrangements as those suggested is beside the question. If heat is used there must be plenty of it, and the precautions suggested are necessary in the case of heated brooders. Nor should the farmer delude himself by ideas only too prevalent that brooding without heat is conducive to hardiness, and that the chickens which die in cold brooding are better dead anyway. These are shibboleths that should be given no credence by the farmer who is looking for results. Not but what chickens can be successfully brooded without artificial heat. They can be so raised, but the two systems have very little in common, and ideas applied to one are not in all respects applicable to the other.

Among the errors into which the chicken raiser using heated brooders is likely to fall are: (*a*) that this heating apparatus is incapable of generating sufficient heat to maintain the desired temperatures; and (*b*) the heating

apparatus is quite efficient, but owing to unsuitable arrangements for conserving the heat in the brooder proper, the requisite temperatures may not be maintained. As an illustration, we can take the hot water circulating system. With either boxes or hovers, if the aperture through which the chickens pass into the heated chamber is not sufficiently protected by a fairly heavy slitted curtain of, say, check kersey or some such material, the warmth will be dissipated and sufficient temperature will not be retained. The same thing can occur through draughts passing through the brooder house, hence all heated brooder houses should be entirely enclosed except for windows made to open front and back.

Many operators work brooders without thermometers, relying on their sense of touch to judge the temperature, or on the fact that the chickens spread out or crowd together as the case may be. These methods are most unreliable, because the sense of feeling to warmth depends largely on external temperature. If, for instance, it is a cold day or night, the temperature of the brooder will feel hot in comparison with the same temperature on a warm day or night. Feeling is therefore not to be relied upon.

Heating Arrangements.

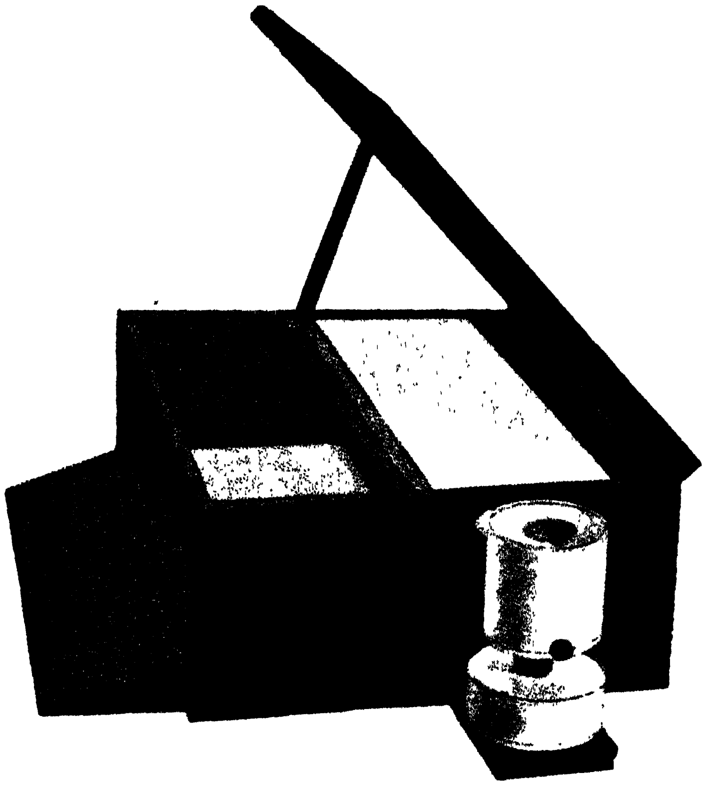
There are pitfalls, too, in the operation of the heater, whether it be a lamp or a coke-heated stove. Draughts, for instance, are a source of danger in that the lamp can be blown out or made to smoke. If it goes out the chickens will crowd to get warmth and the troubles already referred to are almost certain to occur, while if the lamp smokes there is danger of fire. The fact that a lamp or a heater has been out is not always connected with trouble that often manifests itself some days after. The incident is forgotten and the trouble, when it is observed, is put down to disease. Only ordinary care is necessary to obviate the possibility of a lamp going out. It should be kept clean, the wick properly trimmed, and the best of kerosene only used. The lamp should be sufficiently large to do the work required of it without the necessity of too big a light, which is always risky.

With regard to coke-heated boilers or stoves, it is essential that the heater should be large enough to do the work required, and with a little reserve of power in case of necessity. Proper and skilful stoking are necessary to good results. The coke should be broken to an even size, should be kept dry, and should be put into the heater in such a way as will ensure its being compact without packing. It should never be rammed down, as it may jamb and the fire burn out from under the jambed mass, in which case the brooder will be found cold in a few hours. For this reason the night stoking should be particularly carefully done.

There are other things that can happen to a heater, either from carelessness or from want of knowledge. If, for instance, a draught is allowed to come direct to the fire box it may cut away the fire, which will perhaps be found burnt out in the morning, and the whole system be cooled down. Then, again, there must be a co-ordinated adjustment between the damper in the flue and the draught plate below the fire-box. If these are not properly adjusted so that the intake is co-ordinated with the pull from

the flue the heater will work irregularly, sometimes burning out when there is a wind blowing, or going out when there is a calm. In either case the result to the brooder is the same.

All these things call for the exercise of care and good judgment at every point, and they are very material to the success of brooding.



A Good Type of Brooder.

One of the difficulties met with in setting up a poultry keeper in a small way has been the want of a suitable lamp brooder. There are a number of brooders heated by lamps, but very few are on right principles. The accompanying illustration shows one that is being exhibited on the Better Farming Train, which embodies the same principles as the box system in the hot water circulation.

PASTURE improvement trials on the North Coast show that Kikuyu grass stands the winter and dry spells better than paspalum, and farmers are advised to make plantings of this grass during September or October. Those who have already tried this grass speak highly of its carrying capacity and milk-producing qualities. Roots of Kikuyu are obtainable from the Department of Agriculture.

Orchard Notes.

AUGUST.

W. J. ALLEN and H. BROADFOOT.

GROWERS who have not yet completed their ploughing should do all in their power to finish this important operation as soon as possible. The great advantages of early ploughing are that it puts the land in a good condition to absorb winter rains, exposes the soil to the beneficial influences of winter frosts, and assists in decomposition of organic matter that has been ploughed in. It is impossible to forecast what a season is going to be, and if the ploughing is delayed until the spring there is a possibility that the trees and the crop will be adversely affected.

Manuring.

This is a good time to give citrus trees a good dressing of fertiliser, except in the case of sulphate of ammonia or nitrate of soda, which should not be applied until September.

Planting.

The planting of deciduous trees may be continued this month, though earlier planting is always desirable, as a tree placed in its permanent position is making good growth long before it commences to shoot in spring. Citrus trees may be planted in localities where late frosts are unknown. In localities where late frosts are likely to occur it is better to defer planting until any danger from frost is over.

Grafting.

This work may be carried out in many districts later this month. Any unprofitable trees should be grafted with better varieties. Great care should be exercised in selecting the wood for grafting, and only scions from trees which have produced good crops of good quality fruit should be used. A bulletin on budding and grafting may be obtained on application to the Under Secretary, Department of Agriculture, Sydney; price 10d., post free.

Insect Pests.

A strict watch should be kept for San Jose scale, as there is still time to spray any trees which have not yet commenced to shoot and which are infested with this pest. Miscible spraying oil has proved the most efficacious in keeping it in check.

Cherry and peach trees which are infested with aphis should receive an application of spraying oil as late as possible before the buds burst in spring. A good force is necessary to break up the clusters of aphis, and the spraying must be thoroughly done. It may be necessary to follow with an application of nicotine extract after the trees commence to shoot. If this

pest is not kept in check it will do a considerable amount of damage. Aphis not only interferes considerably with the current year's crop, but also interferes with the crop of the following year.

Fungous Diseases.

Powdery mildew appears to be on the increase in many of the chief apple-growing districts, particularly on such varieties as Jonathan and Sturmer, and growers would be well advised to give every attention to it. When pruning this winter the removal of all infected twigs, and later a spraying with colloidal, atomised, or atomic sulphur are the only completely satisfactory ways of keeping this disease in check.

The Possibilities for Sheep at Dorrigo.

For some time the Department has been interested in investigating the possibilities of sheep-raising on the Dorrigo tableland, and Mr. E. A. Elliott, Sheep and Wool Expert, has recently paid several visits to the locality to inspect the stock already there, and to report on the suitability of the country and the likelihood of sheep-raising developing into a profitable occupation.

In his report Mr. Elliott pointed out that crossbred sheep could be run on some of the poorer lands, if healthy sheep were selected and ordinary care was taken in management, but the raising of sheep as a sole means of revenue on the poorer soils should not be considered seriously at present.

Cattle would need to be run during the flush season to keep down the excessive growth of feed, and dog-proof boundary fences would be necessary, as dingoes were very numerous and yarding flocks of any size nightly was out of the question on the steep and hilly country. In any case yarding at night would not entirely obviate the dingo menace, as attacks are made in the daytime at no great distance from buildings. A dingo-proof fence would cost between £100 and £150 per mile. Sheep-proof subdivision fences would require to be built, as sheep require a change of paddocks. Healthy sheep only should be purchased, and drenching would need to be resorted to at the first sign of falling off in condition. Dipping would also be necessary, while the question of getting the right type of sheep into the district would have to be considered.

Running fine-woolled sheep, or raising sheep for wool alone would not be profitable, as this type of sheep suffered most from the wet weather, while the wool of these sheep was also badly affected on the back, being harsh, dry, and discoloured from the same cause. Medium to fine crossbred sheep would suit the conditions best; this was borne out by the healthy state of the sheep of this type seen, and the more natural appearance of their wool. Romney Marsh crossbreds would be the best type to run, and some of the country seen would carry three sheep to the acre or more, with large cattle to keep down the taller growth. The Romney cross, of fine to medium class, would cut a fairly profitable fleece, and the sheep could be expected to withstand the extremely wet conditions at times experienced better than any other type of sheep. They would also provide a good carcase.

A very important factor was the market, as the local butchers preferred to get their sheep from Flemington or to drive them down from the Guy Fawkes district. This difficulty might be overcome if a regular supply could be ensured.

Agricultural Gazette of New South Wales.

The Farm Forestry Questionnaire.

A SUMMARY OF REPLIES RECEIVED.

R. H. ANDERSON, B.Sc.(Agr.), Botanic Gardens, Sydney.

IN May of last year a minute was submitted to the Director of the Botanic Gardens, Dr. Darnell-Smith, dealing with the desirability of bringing before farmers and landowners the great value of trees on farm and pastoral areas, either in the form of shelter belts, breakwinds, and shade trees, or as plantations for the supply of timber and fuel for local and domestic use. It was felt that too little attention had been given in the past to the many advantages of shelter belts, and to the details of their formation and care.

The need for urging the development of private plantations was also becoming increasingly apparent, as the original supplies of timber and fuel had, in many districts, become practically exhausted, or were in measurable distance of being cut out. It was pointed out that there was a marked lack of sufficient reliable data, particularly as regards the species suitable for certain districts and for the various purposes required.

A certain amount of information already existed in this regard, but much of its accuracy had not been determined, and it was often too vague and general to be applied to particular requirements. With a view to co-ordinating existing information and acquiring further details on this subject, a line of work was indicated, one branch of which consisted of the issuing of a questionnaire dealing with the matter. It was proposed to forward this questionnaire to any person or society by whom it was expected the required information could be supplied. In this way the opinions and experience of farmers and graziers would be secured and utilised to the best advantage.

Scope of the Questionnaire.

The questionnaire contained seven questions, the purport of which may be briefly indicated.

The first question dealt with the species of trees most suitable in any particular district for windbreaks (both orchard and paddock), shade and shelter, fuel and general timber, both for hardwood and softwood purposes.

The second question asked for a list of shrubs most suitable for use in windbreak formation.

In question three, the person or society was asked to mention any trees given in the lists which were particularly susceptible to frost, drought, insect, or fungous injury.

The fourth question asked for an opinion whether windbreaks and shelter belts were of particular value in the district dealt with.

Any shortage of timber and fuel for domestic use was required to be mentioned in question five.

Question six asked for local evidence of erosion of the land surface following on the removal of forest or shrub cover.

The last question made provision for any general remarks on the subject.

Copies of this questionnaire were printed, and a large number were distributed throughout the State. The co-operation of the Forestry Commission was sought and obtained, thereby securing the valuable assistance of forestry officers in the various districts. Copies were sent to stock inspectors, staff surveyors, fruit inspectors, field officers of the Department of Agriculture, branches of the Agricultural Bureau, and a number of private farmers, graziers, bee-keepers, etc.

Two hundred and thirty-nine copies were filled in and returned, the returns being classified as follows:—

Forestry Commission officers	57
Stock inspectors	52
Agricultural Bureau Branches	48
Surveyors (Lands Department)	24
Fruit inspectors	8
Farm managers and senior instructors	7
Private individuals	40
C.P. inspectors	3

These were representative of practically every district in the State and of many view points.

Classification of the Replies.

The information contained in these replies was, generally speaking, both copious and valuable, and this opportunity is taken of thanking those who so generously made their knowledge and experience available. With their co-operation the Department has been able to take advantage of the experience of men familiar with the needs and peculiar features of their particular districts by a lifelong association therewith.

The task of co-ordinating the information was a fairly heavy one, particularly as many of the writers gave valuable details, which, although not directly concerned with any of the questions, had an interesting bearing on the general subject-matter and could not be neglected.

The State was divided into districts, and the replies were classified for each division. The choice of species most suitable for the various purposes outlined varied fairly considerably, and these were tabulated in order of preference for each district. The value of some choices was considerably enhanced by short notes dealing with the particular merits, rate of growth, durability, etc., of certain trees, while others pointed out drawbacks to species which were fairly widely grown in their district.

The Advantage of Botanical Names.

A few points may be mentioned in connection with the replies received.

Firstly, the advantage of being able to give a botanical as well as a common name was amply demonstrated. The majority of correspondents were unable to give botanical names, particularly of native species, thus

making the work of exact identification rather difficult. For instance, many listed in their choice of species such vague names as "wattles," "stringybarks," "boxes," "gums," etc. These names might well refer to any one of half a dozen or more species in their particular district. Of course, where only one species of stringybark was known to occur in any particular locality, the work of exact identification was simple. On the other hand, four or five boxes might be known to grow in one particular area, in which case the general term "box" would carry no specific significance. The situation was further complicated by the fact of one species being known by half a dozen common names, and the one common name being applied to different species in the same district. In most cases, however, the exact identification of the species mentioned could be determined with a minimum margin for error, whilst in a few cases the choice of species had to be disregarded on account of vagueness. Where deemed sufficiently important, the person furnishing a return was asked for material of the species in question in order that determinations might be made.

Popular names would be more exact if given (as they frequently are) a qualifying adjective, such as "white box," "red gum," &c.; but the employment of botanical names is the only sure way of acquiring exact and reliable information. That the designation of a particular species by a botanical name is only a matter of habit is shown by the wide use of the term *Pinus insignis* for that particular species. It would appear just as easy to call the "blue gum" *Eucalyptus saligna* as to call the "Monterey pine" *Pinus insignis.*

A second point noticed was the fairly wide range of species listed for one particular division. For instance, in the Central Western Slopes division, thirty-four different species were mentioned as being suitable for paddock breaks. When these were listed in order of preference, however, it was noticed that the first seven or eight received a fairly large number of preferences, whereas the majority received only two or three.

An interesting feature was the prominent place given to native species for shelter belts and shade trees. This might be due to a realisation of the true facts of the case, viz., that in many cases our own native trees, being adapted to local conditions, provide the most efficient and reliable breaks, or it might be due to the lack of introduced trees in the district, or to a want of knowledge concerning them. For orchard breaks, however, the majority of choices fell on introduced trees. A desirable feature was the apparent realisation of the usefulness of existing indigenous timber belts for breaks, especially if cut back and allowed to coppice.

The Value of Windbreaks and Shelter Belts.

Of the 239 replies received to Question 4 on the above subject, fourteen made a non-committal statement or neglected to answer this particular question; 225 gave definite replies, and of these 191, or 85 per cent., were decidedly of the opinion that windbreaks and shelter belts were of particular value in their districts. The remaining 15 per cent. stated that windbreaks in their districts were not particularly necessary, as sufficient shelter

already existed in the form of natural belts of timber, or was afforded by the hilly nature of the country. These referred more especially to areas where very little clearing had been carried out, and where farm lands were surrounded by natural forests, as, for example, in the far South Coast district.

The view of the majority appeared to be that clearing of land for settlement had been carried out injudiciously in many parts, no provision being made for shade and shelter. The country was becoming too open, and in places was entirely denuded of standing trees. Where large estates had been cut up many of the smaller holdings consisted of areas entirely under cultivation, and possessed nothing in the way of shade and shelter. The majority emphasised the importance of shelter for stock, and indicated that loss due to insufficient shelter was often heavy, especially after shearing and during the lambing period.

According to local occupation the importance of shelter for stock, crops or orchards was emphasised. The two most striking features of the replies were, firstly, the almost unanimous decision in favour of the value of windbreaks in increasing the productivity of the land, benefiting stock, and adding to the comfort of the homestead and its dwellers, and, secondly, the small amount of work that had been done by farmers and graziers in endeavouring to establish shelter belts. The importance of, and necessity for, shelter belts was clearly recognised, but few steps had been taken to bring about these desirable features. The cause of this appears to be due to one or both of the following factors:—

(*a*) In many parts the value of shelter belts is only just being assessed at its true worth. In the past, natural forests and belts of timber have been sufficient to provide shelter for adjacent farms and pastoral areas, and it is only comparatively recently that the country is becoming too open and wind swept;

(*b*) The lack of sufficient information and publicity. If given the stimulus of convincing arguments for establishing windbreaks and reliable information concerning planting, formation, treatment, and suitable species, the vague agreement of the landowner with a general principle would doubtless become crystallised into a definite decision to bring about its practical application.

Timber and Fuel Shortage.

Of the replies received under this heading 142 (or 61 per cent.) reported no shortage of timber and fuel for domestic use, 67 (or 29 per cent.) reported a definite shortage, and 24 (or 10 per cent.) indicated a coming shortage.

Although the majority report no lack of timber or fuel in their district, an appreciable number indicate a more or less serious shortage. This is acute in parts, but in others is limited to the vicinity of towns and to the more settled areas. A number are of the opinion that although present supplies are sufficient, the timber and fuel resources are fast dwindling, and it is only a matter of time when the demand will exceed the supply.

Some regard the problem as one for the future, but future needs can only be supplied by present planting. In many cases it was reported that timber and fuel had to be carted considerable distances, whereas a supply on the spot would save both time and money. In parts, not only was the present supply practically exhausted, but the future supply was seriously threatened by the enforced cutting of saplings and young growth for fuel. The better grades of timber, and particularly those suitable for fencing and buildings, were being cut out, inferior species only being abundant.

Erosion.

Dealing with the subject of erosion of the land surface ninety-four returns stated that there was local evidence of erosion following on removal of forest or scrub cover. A fair number left the question unanswered, and it was evident that the inquiry could have been made a little clearer. For instance, it might have been pointed out that erosion is not limited to the results of rain and stream action, but may be also due to wind action.

Many particular instances were given where serious erosion of agricultural and pastoral lands has followed on the removal of forest cover. These instances may be grouped under the following heads:—

(*a*) Erosion due to wind action—for example, the open, wind-swept, red soil plains which had been converted into " scalded plains " by scrub removal, overstocking, and the rabbit pest; also the drifting soils and surface erosion of the mallee lands cleared for wheat-growing.

(*b*) Erosion due to rain and stream action—as for example, the channelling and washing away of useful lands on slopes, erosion on alluvial flats and along the banks of rivers, the sanding up of streams, dams, and reservoirs, and the gradual improvement of good lands by the washing away of the finer soil particles.

A number of the examples given may be quoted as follows:—

" Six miles from Camden, at Glenmore, acres of rich hilly ground are as bare as the floor, and carry no timber or grass. Twenty or thirty years ago this was rich soil growing good crops. Across the road a hundred yards away from this is a valuable forest of beautiful spotted gum."—L. C. W. Smart, Upper Burragorang.

" Sixteen years ago it took a week of steady rain to show discoloration of the waters of the Narara Creek. Twenty-four hours is enough now. The creek has silted up, and it is possible to wade across in places where 10 feet depth was a few years ago."—A. A. Gollan, Gosford.

" I know land that twenty-five years ago would carry a sheep to the acre that is unstockable to-day. The whole surface soil has been blown away, due to the removal of all trees."—W. G. Dowling, Stock Inspector, Forbes.

" Floods on the Bellinger are more violent every year following denudation. In the last flood one man lost over an acre of river flats, swept away to a depth of 6 feet (Mr. F. Cleaver's place, Darkwood). The present practice of alienating land 2,000 feet above the river is inexcusable, and can have but one result."—N. Dares, Forester, Bellinger Shire.

"Old residents inform me that the Armidale creek at one time was a fairly large permanent stream, but after the timber on the water-shed had been destroyed the creek gradually silted up, and to-day only a small channel remains, and there is 15 to 20 feet of silt in the creek bed."—J. Freeman, Armidale.

"The erosion is very marked on the catchment areas of the Burrinjuck storage reservoir and the Goulburn water supply, and no provision is made to combat it and the consequent silting up of the reservoirs. The present main weir on the Goulburn supply, built some thirty-five years ago, does not hold half the water it was supposed to retain, and the second weir, built some ten years ago, shows signs of silt. The silting up of the Burrinjuck reservoir will be even more rapid, as the feeders thereto are a succession of scourings out of cleared country. On the shelving edges of the present water level, inches of silt can be seen, which is an indication of the enormous siltage that must be going on at every confluence. One striking instance of erosion noticed was near Bookham, on the main southern road, where a creek 30 yards wide and 20 feet deep was formed through an old cultivation paddock where originally no definite watercourse existed. This instance had all the necessary factors to assist the denudation—destruction of the timber—loosening of the surface soil by cultivation and checking of protecting grasses—burrowing by rabbits."—A. A. Peirce, Staff Surveyor, Goulburn.

General Opinions.

Apart from the answers to the various questions asked, many of the writers touched on closely allied subjects. The question of fodder trees received special attention, and useful suggestions were made. Several emphasised an important fact, viz., the necessity for preservation of fodder trees by careful lopping. Instances were given where injudicious or careless lopping had resulted in the destruction of valuable trees.

The difficulty of establishing trees in certain parts of the State was given prominence by some. This is particularly the case in the Western Plains division, where the growth of planted trees is made very precarious by the severe conditions prevailing. Unfortunately the need for trees, and the difficulty of their establishment appear to be interlocked in certain districts. Many showed a fine appreciation of the beauty and value of trees, regarding them not only as a material asset, but as a source of comfort and charm to farm dwellings.

The view was expressed that in the past settlers had been too fond of the axe, and were now beginning to reap the results of their injudicious actions The following note by Mr. P. H. Deards, on behalf of the Stratford Agricultural Bureau, is characteristic of a proportion of the replies:—"No work on the farm would show a greater profit if taken over a period of years than that of growing sufficient timber for all the farmer's requirements. This is a matter which must be given serious consideration, even if it requires an Act of Parliament to compel farmers to have sufficient growing timber on their holdings."

Future Scope of Farm Forestry Work.

The detailed analysis of the information contained in these questionnaires, together with investigational work along farm forestry lines, has resulted in an accumulation of facts and opinions which it is intended to make public through the medium of the *Agricultural Gazette*. It is proposed to deal with the subject under the following heads:—

1. An outline of the importance of tree life on farm and pastoral areas, and a description of the various ways in which trees may be employed, *e.g.*, as shelter belts, windbreaks, tree-lots, &c.

2. Methods of establishing trees and their subsequent care. This will include such items as raising seedlings, nursery work, planting out, preparation of ground, planting distances, and protection methods. A section will be devoted to the improvement of existing belts of trees, regeneration methods, coppicing, &c.

3. It is intended to divide the State into districts, each of which will be treated separately under the following heads:—(*a*) The boundary lines of the division and main features from the point of view of tree life; (*b*) a brief account of the principal species occurring in each division, including their partiality for particular soils, &c., and their main uses from the farmer's point of view; (*c*) a list of species suitable for planting for the various purposes outlined.

Information is often so scanty and experimental work in tree-planting so limited that the choice of species is a particularly difficult one. It must be emphasised, therefore, that any list is purely tentative, and based on an admittedly incomplete collection of facts. Mistakes undoubtedly will occur, but these can be rectified from time to time as information becomes more adequate. A start, however, has to be made, and the matter is approached in the hope that discussion will arouse interest in an important subject, and ultimately lead to a still more substantial collection of facts with greater detail and accuracy.

Dipping of Non-pitted Apricots for Drying.

A test of several dipping solutions for the treatment of whole apricots prior to drying was carried out at Yanco Experiment Farm last season, the variety used being Lossie Blenheim.

Three lots of fruit were treated as follows :—

1. Dipped for five seconds in caustic soda solution, 1 lb. to 30 gallons of boiling water
2. Dipped for five seconds in caustic soda solution, 2 lb. to 30 gallons of boiling water
3. Dipped for three seconds in caustic soda solution, 2 lb. to 30 gallons of boiling water

Each lot was then sulphured and all were placed on the rack (on trays), on 23rd December, 1926; they were dry on 4th January, 1927.

The best result was obtained from No. 1 treatment, nice bright apricots being produced; No. 2 treatment gave a nice colour, but not as good as No. 1, while No. 3 treatment gave fruit that was dull and rather dark coloured, and not nearly as good as Nos. 1 and 2.

An Effective Mouse Poison.

A poison that is proving highly satisfactory to farmers pestered by mice and sparrows is made of wheat coated with strychnine and milk. About 12 lb. of wheat (seconds are quite suitable) is first moistened with milk, and any surplus milk then drained off. One ounce of strychnine is next ground up and dusted on to the moistened wheat, which is mixed up by hand, and finally spread out on a bag to dry.

This poison is very strong and a mouse has only to eat one grain to be destroyed. Another advantage is that this poisoned wheat may be kept for two years without losing its effectiveness. As soon as any mice are noticed the poison should be spread around and the mice will quickly disappear.

If the majority of farmers would adopt these preventive methods, mouse plagues would be quite unknown. If all haystacks were made mouse-proof with galvanised iron, the breeding grounds would be removed, and this combined with the use of poisoned wheat would stop a mouse plague at its very inception.

Now that farmers in our wheat districts are becoming more progressive and better organised, local bodies such as agricultural societies or branches of the Agricultural Bureau who take a pride in local improvement might organise co-operative movements to free their districts from the menace of future mouse plagues.—E. S. Clayton, Senior Experimentalist.

A Lucerne Growing Competition.

Parkes Pastoral, Agricultural and Horticultural Association is adding to the list of farm competitions by announcing a lucerne growing competition for the 1928 season. The object is to encourage the planting of lucerne on what may be called dry areas, for the conditions specifically exclude lands where free water occurs at convenient depth, or that have been flooded within six months of judging, or where irrigation is practised. The competition is limited to farmers who are within 20 miles of Parkes, and have stands of 15 acres or more. In addition to the Association's trophies, valued at £6 and £3 for first and second prizes respectively, Messrs. W. W. Watson, H. K. Nock, and E. J. Johnson are offering a challenge trophy worth £15 15s. to be won twice by the same competitor before becoming his property.

The Better Farming Train.

The following is the itinerary for the tour of the Better Farming Train during the month of September:—

September 14—Elong Elong.
,, 15—Merrygoen.
,, 16—Coolah.
,, 17—Mudgee.
,, 19— ,,
,, 20—Gulgong.

September 21—Dunedoo.
,, 22—Binnaway.
,, 23—Coonabarabran.
,, 24—Baradine.
,, 26—Premer and Springridge.

Field Experiments with Wheat.

Manurial Trials at Coonamble Experiment Farm, 1921–26.

W. M. JOHNS, Assistant Experimentalist.

TRIALS with superphosphate at different quantities per acre have been carried out each year for the past six years at this farm with varying success. Owing to adverse climatic conditions the results could not be calculated on two occasions (1921 and 1923), but the results for the other years show the comparative value of various quantities of fertiliser applied.

Over the whole period the trials were conducted on a light red loamy type of soil which had proved itself to be good wheat growing land when the seasons were suitable, and as far as possible the plots were always on uniform soil. The quantities of superphosphate used each year were identical, and the plots were arranged in the following manner:—

1. Check, no manure.
2. ¼ cwt. superphosphate per acre.
3. ½ cwt. superphosphate per acre.
4. Check, no manure.
5. ¾ cwt. superphosphate per acre.
6. 1 cwt. superphosphate per acre.
7. Check, no manure.

In the season 1921 the seed bed was rather dirty, but there was plenty of moisture when the seed was drilled in on 19th April. Germination was very satisfactory but in November the crops became badly tangled by thunderstorms and it was impossible to harvest them separately. Rainfall during growing period, 15.05 inches.

In 1922 the seed bed was dry when drilled, and the seed was sown shallow to avoid uneven germination. Dry conditions prevailing, germination was rather slow, but eventually the plots came away evenly. Rainfall during growing period, 4.95 inches.

In 1923 the season was so dry that the plots failed to come into ear and the experiment had to be abandoned. Rainfall during growing period, 5.32 inches.

In 1924, although dry on the surface, the seed bed was fine, and a good germination resulted. The plots were very even right up to harvesting. Rainfall during growing period, 5.26 inches.

In 1925 weather conditions at sowing time were ideal, and as the seed bed was fine and moist a good germination resulted. Rainfall during growing period, 4.94 inches.

In 1926 germination was excellent, sowing having been carried out under ideal conditions. Although slightly tangled by storms in August and September, little trouble was experienced at harvesting. Rainfall during growing period, 5.81 inches.

The average yields of grain from the various treatments for the four seasons, 1922, 1924, 1925, and 1926, are shown in the following table:—

Fertiliser.	Yield per acre based on percentage.
	bus. lb.
¼ cwt. superphosphate per acre	16 13¾
No manure	15 29
1 cwt. superphosphate	15 24
¾ cwt. "	14 53
½ cwt. "	14 40

Conclusion.

These averages show that the application of ¼ cwt. of superphosphate per acre has a slightly beneficial effect on yield of grain at Coonamble. In isolated cases the larger applications of fertiliser produced heavier yields, but on the average it is not profitable to apply more than the amount stated in this district.

A hay trial was conducted in conjunction with this experiment in 1926, and there also the application of ¼ cwt. of superphosphate per acre was the only amount that showed a profit.

Rotation Trials at Trangie Experiment Farm, 1921–25.

J. A. WILLIAMSON, Assistant Experimentalist.

THAT a rotation other than wheat and bare fallow is needed for the wheat districts of New South Wales is now being fully realised. The Department of Agriculture having foreseen the need for some alternative to the two-course rotation, has been conducting experiments at several of its farms with a view to comparing the different rotations and ascertaining their influence on wheat yields.

RAINFALL during Growing Period each Season.

	1921	1922.	1923.	1924.	1925
	points.	points.	points.	points.	points.
April	345	48	nil	224	9
May	210	25	34	27	244
June	325	62	250	160	758
July	195	119	145	177	100
August	63	51	27	96	64
September ...	121	14	7	305	69
October	60	62	58	142	50
Total	1,319	381	521	1,131	1,285

During the period 1921-1925 the following rotations were compared with continuous wheat growing on this farm:—

Rotation No. 1.—Two course—(1) Wheat, (2) Bare fallow.
" 2.—Three-course—(1) Wheat, (2) Oats for hay, (3) Bare fallow.
" 3.— " (1) Wheat, (2) Sudan grass for hay, (3) Oats for silage or green feed.

The following table shows the results of the yield of wheat each season under the various systems:—

YIELDS from various Rotations.

Year.	Wheat continuously.	Rotation No. 1.	Rotation No. 2.	Rotation. No. 3.	Rainfall during growing period.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	points.
1921 ...	16 27	17 18	17 15	17 57	974
1922 ...	2 27	2 45	2 51	failed	333
1923 ...	failed	3 24	2 54	failed	521
1924 ...	9 4	9 50	9 21	8 4	907
1925 ...	18 48	21 15	24 5	out-grown by weeds.	1,285

Excluding the first year's results, when all plots received the same treatment, the average yields of wheat under the various rotations for the seasons 1922 to 1925 were as follows:—

	bus.	lb.	per cent.		bus.	lb.	per cent.
Wheat continuously ...	6	15	(100)	Rotation No. 2	9	5	(148)
Rotation No. 1 ...	9	18	(149)	Rotation No. 3	1	56	(31)

Although these yields are extremely low, it must be remembered that the yields for two exceedingly dry years are included in the averages. The yields on the bare fallows in these dry years were also rather low, due to there being practically no reserve of moisture in the subsoil. However, the results are sufficient for comparative purposes and for certain conclusions to be arrived at.

The "Wheat-Sudan Grass-Oats" rotation was obviously unsuitable; its inclusion was chiefly with the object of obtaining definite data regarding the influence of such a rotation on wheat yield. It appears to be less satisfactory than the growing of wheat continuously, only one crop being taken off the land under this rotation in the final four years of the trial. The Sudan grass appeared to have a detrimental effect on the soil, leaving it dry and hard, and when the soil was ploughed after this crop had been removed it turned over in a harsh dry condition, devoid of all character. The suggestion of some authorities that Sudan grass may have the power to use the hygroscopic moisture in the soil, thus leaving the soil in dry times entirely devoid of moisture, appears feasible.

The "wheat and bare-fallow" system and the "wheat, oats, and bare-fallow" rotation were both a decided improvement over the system of growing wheat continuously on the same land.

That fallowing in conjunction with wheat-growing has many advantages and is one of the main factors in improvement of the yield, is now well known, but if the practice of alternating a bare fallow with the wheat crop

is persisted in, the humus or organic matter of the soil will be sorely depleted and the fertility of the soil will be eventually considerably reduced. Hence, in order to obtain the best possible results from fallowing, some system of crop rotation should be followed.

The oats crop not only provides a good supply of green feed, ensilage, hay, or grain, but it also assists in the control of fungous diseases. Good yields are obtained at very little cost from oats grown on wheat stubble, providing a fairly reliable rainfall is enjoyed. The yields for hay and green feed in the years of fair rainfall were as follows:—

	1921.	1922-23.	1924.	1925
	t. c.		t. c. q.	t. c.
Oats as hay, sown on wheat stubble	2 14	Crops failed in both these years.	0 17 1	1 0
Oats as ensilage after Sudan grass	9 18		2 5 0	5 17

When the practice of making provision for droughts by laying down pit-silage, and storing grain in galvanised iron silos becomes more general, the value of oats in the wheat rotation will be more fully appreciated. The wisdom of allotting a portion of the oat crop for hay for the farm horses, as a safeguard against reinfection of fallows with the fungus spores possibly contained in wheaten hay, has been frequently recommended.

In conclusion, the "wheat, oats, fallow" rotation has much to recommend it in districts of fairly reliable rainfall in preference to the "wheat fallow" system, though, of course, it is not an ideal rotation.

Early or Late Sowing of Wheat.

There is undoubted strength in the arguments of those who advocate late sowing—say, July. It gives time to clean the seed-bed of weeds; and, other things being equal, clean crops imply heavier yields. Indeed, I am satisfied that weeds do more towards keeping our crop yields low than all the diseases to which the latter are liable. Late seeding also reduces the tendency towards heavy straw production, minimises the chances of lodging and blighting of the crops, all of which is in favour of heavier mean grain yields.

But all these undoubted advantages of late sowing are subject to the following reservations:—(1) We must have sufficient team strength and implements to cover the area we wish to sow in a short period of time. (2) Normal winter conditions must offer no special difficulties to seeding operations: frequently with us the land is saturated with moisture in July to the extent that team work on fallow land is often difficult, if not impossible. (3) Spring and early summer conditions must be such as to lead to a sufficiently long growing period in crops, and permit of normal grain development. Now, under our average climatic conditions, these reservations hold good in no more than one season out of five. By sowing in July when the land is cold and plant development slow, we reduce the growing period of the wheat plant by two to three months, which in four years out of five will have the effect of reducing crop yields to a very material extent.—A. J. Perkins, in the South Australian *Journal of Agriculture.*

Skeleton Weed.

(*Chondrilla juncea.*)

E. S. CLAYTON, H.D.A., Senior Experimentalist.

THIS weed, known by the various names such as Skeleton Weed, Naked Weed, and Gum Succory, is causing a good deal of concern. It has proved to be one of the most troublesome weeds found in wheat districts, having such a peculiar habit of growth that it can withstand even the frequent cultivations given the fallow by the best farmers and heavy grazing of the stubble and fallow by sheep.

Habit of Growth.

The plant commences growth in winter, the leaves spreading out close to the ground. Later it sends up a branching stalk which produces flowers and seeds in late summer. This stalk dies at the end of the autumn, but unfortunately the root, which penetrates very deeply into the soil, remains alive and new shoots are sent up from the parent root stock. The root is known to be biennial, and it is thought that it is even longer lived. The plant is usually found in clumps which steadily increase in area. It is usually found in the medium to light loams of the more favoured portions of the Riverina and South-western Slopes. It appears to prefer the light to medium soil rather than the heavy clays, and up to the present it is rarely found growing in the latter type of soil. The plant is eaten by sheep, and for this reason did not cause any alarm for a few years. It can, however, withstand close grazing in stubble or on fallow without being eradicated.

Behaviour under Cultivation.

The peculiar habits of the weed enable it to withstand the wheat cultivation methods adopted in the Riverina. Once the plants become well established they are most difficult to eradicate. Even when the land is ploughed to a depth of 4 or 5 inches, new shoots are sent up from the original root. Even frequent deep summer cultivations of the fallow, although they destroy and prevent top growth, do not kill the plant, and when the wheat crop is sown, shoots are quickly sent up from the root and the skeleton weed grows as quickly, if not quicker than the wheat.

The weed exerts a powerful influence on wheat or oats growing in its vicinity, and although the plants are frequently not sufficiently numerous to choke all wheat growth, any wheat plants that do survive are extremely weak and sickly, due apparently to some influence other than the mere physical effect of mild crowding.

How the Weed is Spread.

Although seeds are produced under field conditions, they are not the chief cause of the spread of skeleton weed. Seedlings are apparently destroyed by ordinary fallowing methods, but once the roots become well established and

penetrate to the lower levels of the soil even long summer fallowing, including frequent summer cultivations, will not destroy the weed. It is spread chiefly by farm implements—ploughs, disc, or springtooth cultivators, and even harrows break the root stocks, drag them along, and transplant them elsewhere in the paddock. That this is the chief means of spreading the weed is indicated by instances occurring in long, narrow paddocks, where one side of the paddock is free from the weed, while the other side is heavily infested. In these paddocks, all the cultivations have been in the same direction (lengthwise with the paddock), and the weed has been spread right along one side by the implements.

It can be readily understood that once established the weed quickly spreads and occupies more land. Each parent root stock generally sends up a number of new shoots, consequently each clump of the weed tends to become larger, and, in addition, many new clumps are commenced by the numerous plants transplanted by the cultural implements.

Suggestions for Control.

A series of experiments is being conducted near Coolamon with a number of plant poisons, and valuable information should be forthcoming as to the the best way to deal with small clumps of the weed. The difficulty has been that although the top growth can be easily destroyed by poison, the plant shoots again from lower down the root. A poison that will penetrate well down the main root is required. Cases are on record where the plants have been dug out to a depth of 1 foot and have grown up again.

The application of coarse salt is one of the most effective means of poisoning skeleton weed. If the salt is applied at the rate of a liberal double handful to each individual plant, it will kill the top growth and cause the upper portion of the root to rot and thus destroy the plant. Apparently the best time to apply the salt is in July or August, when the plants are commencing growth.

Expense must necessarily be taken into account when considering means of eradication. Poisons of all sorts, including salt, are expensive to apply, and it is very questionable whether it will pay to poison a heavily infested paddock. The application of salt is certainly an economical and practical way of eradicating the weed where the infestation is only light. Care must also be taken in cultivating the land to see that the weed is not spread by the implements.

If these measures are promptly adopted as soon as the weed is found on the farm, they will eradicate it and prevent its spread.

Where skeleton weed has become well established and widespread in a paddock, however, it is thought at the present time that it is quite out of the question to attempt to eradicate it by means of salt or poison, by reason of the excessive expense that would be incurred. The expense would be very heavy, and unless the work is carried out in a most thorough manner, the results would not be satisfactory.

The best advice that can be offered at present is that where a paddock is heavily infested, a crop of wheat or oats should be sown, together with 4 lb. of Wimmera rye grass, 3 lb. of Subterranean clover, and 1½ cwt. of superphosphate to the acre. The cereal will be harvested for grain, and the paddock will then be left out of cultivation for three or four years, during which time the Wimmera rye grass and Subterranean clover will provide excellent grazing and increase the carrying capacity considerably. Each autumn the paddock should be top-dressed with about 84 lb. of superphosphate to the acre.

If this scheme was adopted a very vigorous pasture would result which should be heavily grazed. The rye grass and clover, stimulated by the superphosphate, would have the effect of choking the skeleton weed out under grazing conditions, as the plant seems to need an occasional cultivation to make its most vigorous growth. After being grazed for three or four years it would probably be found that only a few plants had survived, and these could then be treated with salt. The behaviour of the plant certainly indicates that once it has so got out of hand in a paddock that wheat yields are seriously reduced, cultivation should cease if the plant is to be eradicated cheaply. Cultivation, instead of destroying it, only stimulates its growth, and is the chief means of spreading it, not only in a paddock, but also from one paddock to another.

The Skeleton Weed.
(*Chondrilla juncea.*)

A Warning.

Skeleton weed is such an objectionable weed in wheat districts that farmers should endeavour to see growing specimens so that they can immediately identify it on their own properties should it make its appearance. Growing specimens can be seen each year in the Agricultural Departments' exhibit in the Agriculture Hall at the Sydney Royal Show, and also in the "Grasses and Weeds" car of the Better Farming Train when the train is touring wheat districts.

The accompanying illustration is from Miss Ada Georgia's "Manual of Weeds."

ONE of the commonest ways of spreading abortion is the sale of infected cattle. Surely one of the wisest things a dairy farmer can do is to have a paddock where he can isolate a cow till he is certain it is free from disease. Yet very few have it.

Mercury-Phenol Compounds for Treating Seed Maize.

W. H. DARRAGH, B.Sc. (Agr.), Assistant Plant Breeder, Grafton Experiment Farm.

FOR a number of years diseases which cause a rotting of the roots and stalk have been observed to be present in the maize crops of this State. These diseases have been shown to carry over from season to season both in the soil and in the seed itself. Recent investigations in America with mercury-phenol compounds have shown that some of these compounds may be useful in treating seed maize. It has been claimed that these compounds are useful for treating badly-diseased seed, but are not of much use for treating apparently good seed. An experiment has been carried out at Grafton Experiment Farm with a view to testing one of the mercury-phenol compounds.

In the experiment four grades of seed were used:—

Grade 1.—Apparently sound, barn-selected seed. In this grade only those ears showing good lustre and well filled grain, together with heavy weight in proportion to size, and absolutely clean butts, were selected. The ears were free from diseased grains.

Grade 2.—Ordinary farm-selected seed.

Grade 3.—Seed from ears showing stringy, shredded or discoloured shank attachments. These ears were selected on the stringyness of the butt. It was found that the grain was generally rougher in the dent than that of Grade 1, and of a starchy nature.

Grade 4.—Seed from ears showing split grains, &c., as the result of infection through the silks. Ears were selected from those showing only one or two diseased grains to those showing many diseased grains. In most cases the diseased grains were separated out, as it was thought they would not germinate. Grains which were in contact with these were left in the sample.

Seed from each grade was divided into four lots, viz., *a*, *b*, *c*, and *d*.

Lot (*a*) was immersed in a 0.25 per cent. solution of a mercury-phenol compound for one hour.

Lot (*b*) was dusted with the same compound in a dry powder form.

Lot (*c*) was soaked in water for 24 hours and electrified as given by Bennet's "Electroculture," p. 34.

Lot (*d*) was soaked in water only, and was not treated in any other way. It may be regarded as untreated in each grade.

Each plot was sown with 100 grains, each 1 foot apart, on 27th September,

The Season.

There was little rain during August (72 points) and September (61 points), and the rainfall in October was light and well distributed and of little use owing to hot drying winds. There was no rain in November, but in December the drought broke. The following falls of rain were recorded:—

1926.	Points.	1927.	Points.
September	61	January	1363
October...	76	February	56
November	0	March	321
December	760	April	334

The plots were sown immediately after rain in September, and had a fair chance to germinate.

Germination.

Germination counts made of each treatment in each grade are given in the following table:—

NUMBER of grains germinated.

	Lot (*a*).	Lot (*b*).	Lot (*c*).	Lot (*d*).
Grade 1..	90	86	86	83
" 2.	85	77	73	74
" 3.. ..	72	42	78	73
" 4..	78	43	64	64

The mercury-phenol compound in liquid form gave improved germination in Grades 1, 2, and 4. When the same compound was used as a dry powder and dusted on the seed it had a deleterious effect in Grades 3 and 4.

The electrical treatment showed no effect on the germination.

An examination of Lot (*d*) in the germination table shows that as the apparent freedom from disease of the sample increased, so did its power of germination.

The Yields.

Little difference was noted in the various plots during the growing stages. The plots were harvested on 27th April, 1927, and in addition to the yield of each plot being taken in pounds, a count was made of the number of upright plants in each row, and of the number of ears in each row that had clean butts and were not diseased in any way.

The yields of the plots are set out in the following table:—

YIELD per plot based on percentage yield.

	Lot (*a*)	Lot (*b*).	Lot (*c*)	Lot (*d*).
	lb.	lb.	lb.	lb.
Grade 1...	40·4	34·7	......	32·1
.. 2.	25·9	23·4	27 3	27·4
.. 3...	28·8	21·4	27·1	23·5
.. 4...	30·9	16·7	15·5	18·8

This table shows that in all grades the seed which was treated gave a higher yield than the control plot, except in the case of Grade 2 seed.

Only in case of Grade 1 seed did dusting prove better than the check, The amount of dust used in dusting the seed was much smaller than that used in America.

The electrically treated seed did not show to advantage over the check, except in the case of Grade 3.

Summary.

The data from this experiment tend to show that the mercury-phenol compounds may be of use in the treatment of seed maize, but as this test has been carried out only on a very small scale, further experiments on a field scale are necessary with these compounds in solution before a definite recommendation can be made.

WHEN BUYING CONCENTRATES.

IN buying concentrates, it should be borne in mind that the market price of any particular feed is no indication of its value to the individual farmer. The value of any feed to the farmer depends largely on the nature and composition of the other feeds which he has at hand.—T. HAMILTON, in the *Rhodesia Agricultural Journal.*

THE VALUE OF WHEAT BREEDING TO CANADA.

CANADA is now the third largest wheat-producing country in the world. This achievement is directly due to the experimental work in wheat breeding carried out at the experiment stations. Up to the end of last century certain strains of wheat, such as Red Fife and Huron, were grown successfully in the Eastern Provinces. But the shorter growing period and the early frosts of the North and West prevented successful wheat production in these vast regions.

A writer in the *Scottish Journal of Agriculture* relates that Dr. Saunders and his associates, by breeding and selection, produced a strain which ripens about a week earlier than the Red Fife, and which has a strong straw and a non-shattering head, which are obviously valuable characteristics for the great wind-swept plains. This strain, known as Marquis wheat, made wheat-growing possible for the whole of the Western Provinces, and considerably extended the Northern limits of successful wheat production. To-day it is estimated that 95 per cent. of Canada's wheat areas is in these prairie provinces. It is very interesting to note that 90 per cent. of the total wheat yield of the Western Provinces is developed from the single seed of Marquis wheat discovered in 1903. It is estimated that Marquis wheat has increased the earning power of Canadian farmers by at least 20,000,000 dollars per annum.

The wheat growers of New South Wales owe, relatively, quite as much to the plant breeder. Indeed it is possible that the debt is even greater here, for breeding and selection have produced a number of varieties suited to a great variety of conditions and have thus added incalculably to the security of wheat growing in this State.

Hickory King Maize Contest.

Season 1926–27.

The Hickory King maize contest, promoted by the Department of Agriculture to determine the best strain of maize of that variety for the manufacture of cornflour, was carried out in the past season under the supervision of the agricultural instructors in the North, Central, and South Coastal districts. The conditions, generally, were the same as those governing the contents in previous seasons, and Messrs. Clifford Love and Co., Ltd., Sydney, again donated £10 10s. prize money.

The North Coast plot, which was supervised by Mr. M. J. E. Squire, was sown on 24th December, 1926, on black alluvial soil on Mr. M. D. O'Connell's farm at Coramba. The land was ploughed in July and again in early December, and then harrowed, rolled, and again harrowed shortly before planting. Planting was done by hand, and the germination throughout was excellent; after-cultivations kept the weeds down. Fertiliser (superphosphate and bonedust) was applied at planting time at the rate of 1 cwt. per acre. Harvesting took place on 22nd June, 1927.

The Central Coast plot was supervised by Mr. J. M. Pitt, and was sown on 6th December—earlier sowing being impossible as on the North Coast, owing to the very dry conditions—on Mr. T. Macdonald's farm, Taree Estate. The plot had previously grown millet, and was given one ploughing prior to sowing the maize. Like most of the late-sown crops, the yields were generally good, two strains topping the 100-bushel mark.

The South Coast plot was supervised by Mr. R. N. Makin. Planting was carried out late in December, and germination and growth were very satisfactory until very dry weather set in during February, resulting in the crop failing to set cobs.

The following table gives the yields from the different plots on the North and Central Coast farms, and the averages:—

Result of Contest.

Competitor	North Coast.		Central Coast.		Average.	
	bus.	lb.	bus.	lb.	bus.	lb.
J. T. Callaway, "Forest Lodge," Gilmore ...	55	32	106	4	80	46
C. E. Drury, Glenthorne...	55	32	106	4	80	46
J. W. Booth, Timagog	62	24	85	25	73	52½
C. G. Smith, Timagog	53	24	89	48	71	36
H. C. Flett, Taree	47	28	81	1	64	14½
C. Lean, Glenthorne	48	52	75	7	62	1½

Note.—The South Coast plot failed.

Messrs. J. T. Callaway and C. E. Drury divided for the best yields on the Central Coast, securing £2 2s. each from the prize money. They also divided for the best average yields, another £2 2s. each being awarded in that connection.

Mr. J. W. Booth obtained the highest yield of the North Coast plot, and was awarded a prize of £2 2s.

In conformity with a previous decision to hold this contest every alternate season, the next will be held in 1928-29. Full particulars will be given in later issues of the *Agricultural Gazette.*

CO-OPERATION AT BATLOW.

BATLOW fruit-growers commenced co-operative operations in 1923 by establishing cool stores with 8,000-case space capacity. In 1924 they increased their stores to 14,000 cases, and, in addition, formed a co-operative packing-house company, and provided and operated the most up-to-date and efficient packing conveniences and plant. In 1926 the success of the existing cool stores demanded increased accommodation, and the stores were again enlarged to provide 24,000-case space. Not satisfied with trebling their undertaking in the first four years of their operations, the society is at present engaged in duplicating their stores, and will have from 45,000 to 50,000-case space available to handle the 1928 apple and pear harvest. As the stores are filled twice in the normal year, Batlow will be able to store upwards of 100,000 cases next harvest.

The cool stores and packing-house have enabled the growers to exercise a control over their marketing, and in this connection their Sydney selling depot and their direct country sales have been mutually beneficial to the producer and the consumer.

There are only thirty-six members of the cool stores and twenty-four of the packing-shed. The capital costs are: Cool stores, £14.000; packing-shed, £3,500, making a total capital outlay of £17,500, of which £11,705 has now been actually provided by the growers. Of this £11,705, calls on shares have provided £5,785 and retention and loan levies £5,920. To provide for the 1927-28 extension of the cool stores, this latter sum is being capitalised in the form of shares paid up to 5s., which are being issued to existing shareholders in proportion to their individual retention and loan levy credits. It is of interest to note that the loan levies—which in the case of the packing-house amount to 3d. per packed bushel case on all fruit handled for shareholders, and with the cool stores to 6d. per case space per annum—both charges representing comparatively small deductions—have provided the means whereby the latest extension work is being financed.

The new work is estimated to cost £11,500, the whole of which amount will be advanced by the Rural Bank, the company having made arrangements by a system of case-levy to repay the whole within ten years. It is interesting to realise that the capital expenditure for the thirty-six people involved is £29,000, and that they are prepared, in view of their experience, to go on and on with the steps that will give them what all secondary producers require to get—the control of their produce.—C. C. CRANE, Agricultural Bureau Organiser.

Farmers' Experiment Plots.

BROOM MILLET, 1926-27.

South-western District.

G. NICHOLSON, H.D.A., Agricultural Instructor.

BROOM millet trials were conducted at two centres in the Tumut district during the season 1926-27. The farmers co-operating with the Department were:—

Butler Bros., Bombowlee, Tumut.
J. T. Clout, "Elderfield," Tumut Plains.

Seasonal conditions were unfavourable for the production of heavy crops. The land received a thorough soaking during the winter, but with the arrival of warmer weather only light scattered showers fell. The crop derived very little benefit from the rain which fell during the growing period, hot, dry weather prevailing until January, when a good fall was recorded, and from then onwards was practically a rainless period until harvesting. The rate of growth was affected, and, as might be expected, yields were low, but the dry, warm autumn was particularly favourable for the production of bright, clean brush.

The rainfall was:—October, 50 points; November, 50 points; December, 93 points; January, 220 points; February, nil; total, 413 points.

Notes on the Plots.

Tumut Plains.—Soil, black, alluvial. The area, which had been cropped to oats in 1924 and maize in 1925, was ploughed September, harrowed twice, then cultivated and rolled first week in October, and spring-toothed and rolled prior to sowing; sown on 22nd October. In the unmanured plots germination was fairly satisfactory, but in the manured plots germination was uneven, the manure apparently being responsible for the faulty stand. In this respect the plot on which P8 was applied suffered most; but for the fact of the faulty stand, M5 would have shown up to much greater advantage. Judging on appearances in the field, W 2 looked very promising and cut by far the biggest bulk, but failed to weigh well.

A spacing trial was also carried out, the plants in one section being left thick (about 4 inches apart), and those in the other section being thinned to 12 inches. No comparative weights were taken, but the brush from the wide spacing was much coarser, and of inferior quality compared with the thicker planting.

Bombowlee, Tumut.—Soil, black alluvial loam, cropped continuously for many years; land ploughed early October, rolled, harrowed twice, and cultivated during the month; sown on 30th October. At both centres areas were sown with selected seed supplied by the Department of Agriculture. The brush from these showed up in marked contrast to that from the bulk

seed, and was highly commented on by the growers. The brush showed greater uniformity and the quality, as to length, soundness of fibre, and absence of thickened and branching central stem, was well maintained. Although by no means free from red stain infestation, selection had undoubtedly improved the resistant qualities of the strain, for at one centre the attack was only of a very light nature, while rows growing near by, sown with unselected seed, were badly affected.

The results of the trials are shown in the tables.

Treatment	Bombowlee Tumut.	Tumut Plains.
	lb.	lb.
* M6 2 cwt. per acre	469	290
Superphosphate, 1¼ cwt. per acre	383	259
M5. 2 cwt. per acre	357	309
W2, 2 cwt. per acre ...	348	251
P8, 3 cwt. per acre	325	292
P7, 2½ cwt. per acre.	322	239
No manure	288	259

Spacing Test at Bombowlee.	
	lb.
Left thick (about 2 inches apart)	275
Thinned to 6 inches apart	325
Thinned to 12 inches apart	300

* M6 consists of five parts superphosphate, and 3 parts muriate of potash; M5, 2 parts superphosphate and 1 part sulphate of ammonia; W2, 4 parts superphosphate, 2 parts sulphate of ammonia, and 1 part sulphate of potash; P8, equal parts superphosphate and blood and bone; P7, equal parts superphosphate and bonedust.

An Additional Value of Green Feed.

Fresh green roughages and succulents in general have a low protein content, owing chiefly to the relatively large amounts of water they contain. It should be remembered however, that succulent feeds have a value not indicated by chemical analysis. These feeds are palatable, laxative, easily digested and stimulate milk production.—T. Hamilton, in the *Rhodesia Agricultural Journal.*

Varieties for Cross Pollination.

Varieties planted for cross-pollination must have an affinity for each other: that is, the pollen of one must be acceptable to the pistils of the other, and such as will give the heaviest yields of good fruit. Both must be good pollen producers. If one is a shy bearer, and the other blooms in abundance, the variety producing little pollen will, of course, be greatly benefited, but there will be little reciprocal action.—J. M. Ward, in the *Journal of Agriculture of Victoria.*

New South Wales Butter Quality.

A. M. BROWN, Senior Dairy Instructor.*

UP to the end of December, 1926, the butter season which has just closed was a very poor one on the production side. Scattered showers, which fell in most of the dairying districts during the early spring were quite insufficient to give the pastures the necessary stimulating growth as the hot weather approached, and as the season advanced droughty conditions developed, accompanied by bush fires, which had such a retarding effect on production that at the beginning of December the output of the butter factories in New South Wales was barely sufficient to supply local requirements.

At this stage, when seasonal conditions had assumed the most serious aspect on record for dairying, the situation was relieved by torrential rains, which in some places caused floods, while in others similar inundations were threatened. Production generally then made a most remarkable recovery, but the total output failed to reach the maximum obtained the previous season.

Quality of Cream Adversely Affected.

With these abnormal conditions prevailing, it was only to be expected that the quality of the cream supplied to the different factories became adversely affected. While the bush fires were raging, for instance, it was not an uncommon occurrence to detect a distinct flavour of smoke in numbers of butters, due probably to the cream from which these butters were made having absorbed the taint from the smoke-permeated atmosphere.

The unusually heavy and continued rainfall caused much of the low-lying pastures to become water-logged, and in one case this condition of the grazing land was considered responsible for a peculiar aroma, described as similar to that of mushrooms, to be given off while the cream was being pastuerised. This particular odour, however, was not noted in the butter from that factory, and incidentally the occurrence may be taken as demonstrating the value of pasteurisation in treating this class of cream.

These unusual flavours and aromas are not usually in evidence during a normal season, and no doubt many similar instances of inferiority due to abnormal circumstances came under the notice of both managers and the field staff of the Dairy Branch during that trying time. All such conditions tended to make the manufacture of a high-class butter most difficult.

However, despite the disadvantages experienced the general quality of the butter produced throughout New South Wales during the 1926-27 season reached such a high standard as to compare more than favourably with that of the previous season's production, and it should be considered a tribute to the increasing care which the farmer is taking of his cream,

* Paper read at the Conference of Butter Factory Managers and Secretaries, Sydney, June, 1927.

to the efficiency of the plants and equipments at the majority of the factories and their more sanitary condition, and to the skill and care exercised by those responsible for the treatment of the raw material in the different stages of its manufacture into butter, that these good results have been made attainable.

Faults in Flavour and Aroma of Butter.

Good as the general quality proved to be, there were a few individual instances of some rather outstanding faults in the flavour and aroma of butter, which when first noted appeared to present problems requiring some solving, but they were successfully dealt with in the great majority of cases and a vast improvement resulted.

Details of how two at least of these particular faults were caused and remedied will be of interest. It might be stated that the data about to be quoted was obtained, either during investigations carried out by members of the staffs of the Dairy and Biological Branches of the Department of Agriculture, or from managers themselves who have experienced trouble with the particular faults referred to.

Flavour Similar to that of Condensed Milk.

The first of the faults with which it is proposed to deal is what is termed by graders the "condensed milk flavour." As the name signifies this flavour closely resembles that of condensed milk, and when pronounced, all semblance of true butter flavour is absent. A strong unpleasant aroma is also in evidence. There appears to be little doubt that the trouble is an aggravated form of cooked flavour, and is primarily due to the cooking or over-heating of the curdy matter in the cream, combined with the caramelising or burning of the milk sugar content, although evidence is not lacking that bacterial action sometimes plays a part in causing this flavour.

How, and at what stage of the pasteurising process this cooking takes place and how to overcome it is what has specially exercised the minds and energies of those who have interested themselves in the subject. Here are the details of some of the results obtained in dealing with the prevention of condensed milk flavour in butter:—

No. 1 Instance.—The pasteuriser in use at a factory had been running at irregular speed and belts had been slipping off altogether during the process of heating. When this happened, portion of the cream had sometimes remained in the heated machine for ten to fifteen minutes before restarting. These delays occurred two or three times during the process. Thus the irregular feeding of the pasteuriser and its slow speed were considered to be the causes of the condensed milk flavour noted in the butter from this factory.

To remedy the defect a steam ejector was installed for feeding the machine, which gave an even flow of cream, and the speed of the beaters was increased to about 180 revolutions per minute. Immediately after the application of these measures condensed milk flavour disappeared from the butter.

No. 2 Instance.—Engine trouble, due it was said, to the use of inferior charcoal in connection with a suction gas plant, had resulted in frequent stoppages during the process of pasteurisation and caused a portion of the cream to be left in the heated machine until re-starting, where it became subjected to a high temperature for too long a period. Again, through the first lot of cream coming in contact with the hot surface of the pasteuriser when the machine was first started, portion of this cream appeared to become scorched, and until the correct temperature was reached it was run back into the neutralising vat through the by-pass, where it remained until it entered the pasteuriser again. It was thought that one of these factors or the two combined were responsible for causing the flavour under review.

The engine trouble was rectified, thus preventing harmful stoppages during the pasteurising process and rendering less likely the possibility of over-heating a portion of the cream. Instead of the by-pass being used to allow the cream not heated to the required temperature to run back into the neutralising vat, water was first allowed to pass through the machine and when the temperature showed 185 deg. Fah., it was followed by the cream which passed straight over the pasteuriser to the cooler. These changes had the desired effect and the inferior flavour disappeared from the butter.

No. 3 Instance.—At another factory the unusual number of shafts and counter-shafts, the latter of which were rather light, caused breakages of belts, with the consequent holding up of operations. Delays such as were occasioned by these occurrences during the process of pasteurisation would, as in above instances, cause portion of the cream to become subjected to a high temperature for some time before re-starting the pasteuriser. The churns and other wooden apparatus in use were rather old and apparently were not kept as clean as they should have been. Contamination from these churns had previously been indicated by results of bacteriological examinations of butter made in them. Certain organisms, which produced a caramel or cooked aroma in pure culture, had been isolated from time to time by officers of the Biological Branch, and it was thought that these contaminating influences might have contributed in some way to cause this condensed milk flavour.

The shafting has not yet been altered as far as is known, but it is a significant fact that after special attention had been paid to the cleaning of the churns and other utensils the condensed milk flavour disappeared, although it had been most persistent in butter from this factory for a considerable time.

Other instances could be quoted where interruptions in the heating of the cream during the process of pasteurisation and irregular feeding of the machine caused trouble in the direction indicated, and it is considered that these two factors are more often responsible than any other for the production of "condensed milk flavour" in butter.

In connection with the feeding of the pasteuriser, the use of an ejector for the purpose quoted is gaining favour and has given good results

Irregularity in Flavour of Butter from same Vat of Cream.

A peculiar feature in connection with the occurrence of condensed milk flavour has been that at times the trouble appears to manifest itself to a greater degree in some churns of butter than in others made from the same vat of cream.

If this flavour were invariably noted to be more pronounced in the butter made from the first lot of cream that comes out of the vat the theory might be advanced that any scorched curdy matter present naturally sinks to the bottom of the vat, and would there impart a condensed milk or cooked flavour to the cream with which it comes in contact for any length of time. These flavours would, therefore, be more likely to be observed to a greater degree in the butter made from this cream than in that made from the remainder of the cream in the vat if the bulk had not been properly stirred, but it has frequently been observed that the butter most affected came from subsequent churnings, so that the theory mentioned is not always applicable.

The conclusion, therefore, is that factors other than the one already suggested, combine to bring about these instances of irregularity in flavour. There is some evidence that bacterial action is one of these factors.

Members of the staff of the Biological Branch, as before stated, have isolated organisms, one a micrococcus and the other one of the coli group, which each produce a strong caramel or cooked aroma in pure culture, while it has been found that where sources of contamination which encourage the growth of bacteria has been removed by thoroughly cleaning churns and other utensils, the condensed milk flavour has disappeared.

It has frequently been proved that one churn in a factory can be a greater source of contamination than another in a cleaner condition, so that if the action of germ life is in some way responsible for the production of condensed milk flavour, it is reasonable to expect that this or other biological flavours will be more pronounced in butter made in the churn which is contaminated than in butter out of a churn which is in a more sanitary condition.

Whether the evidence to hand is sufficiently conclusive to credit bacteria alone with definitely causing the irregularity in flavour under review, is at least somewhat doubtful without further corroboration, and the occurrence appears to present a problem yet to be finalised.

Disagreeable Aroma Noted in Butter.

The other somewhat prevalent fault in some butters which it is proposed to discuss here, is that of a very disagreeable aroma. This odour is very similar to that observed in butter made from cream which has been over-neutralised or when this process has been carried out in a faulty manner. It closely resembles the aroma of decomposed flesh. It has sometimes made its appearance spasmodically in butter from widely separated districts, while in other cases, it can be detected regularly for some time in the butter from one particular factory.

Originally it was thought that the trouble was associated with the neutralising process in the manner before mentioned, but certain observations and investigations have since tended to indicate that bacterial action may also be responsible wholly or in part for the development of this objectionable aroma, and that the infection takes place at some period after the cream from which the affected butter is made has left the vat and passed into the churns.

This conclusion was suggested in the first place by the fact that in a large number of instances it was found that the trouble manifested itself to a greater degree in some churns of butter than it did in others made out of the same vat of cream, while in some cases butter from one or two churns was affected but the remainder was apparently free from the defect, though churned from the same vat of cream. If either over-neutralisation or faulty neutralisation were the only causes of the trouble, it is reasonable to assume that all the butter made from the vat of cream which had been subjected to incorrect manipulation of the neutralising process would be affected to a similar degree, as this cream would be thoroughly blended by the time it had passed through the pasteuriser, over the cooler and into the vat, where it would be also stirred by the attemperator coils. The theory that bacterial action also plays a prominent part in the development of this aroma in some cases at least is supported by the following data, which was obtained during certain investigations.

When it was first noted that butter from a particular factory developed this disagreeable aroma, a number of samples were forwarded to the Biologist for examination. His report invariably indicated that very high counts of objectionable bacteria were present, indicative of after contamination. The Dairy Expert arranged for the Senior Officer in charge of the district where this factory was situated, in conjunction with an officer from the Biological Branch, to carry out investigations with a view to ascertaining the cause of the trouble, and if possible, assist the Manager to rectify it. Preliminary observations revealed the fact that salt river water at a temperature considerably below boiling point had been used for washing up for some considerable time. This water was totally unsuitable for the purpose and even when soda was added, it failed to remove the grease from the utensils. The action of this water had also resulted in the rusting of flumings, pipes, etc. It was evident that the churns and other wooden apparatus had become fat-saturated.

In the course of further investigations, butter (*a*) was made in a small hand churn from cream taken direct from the vats; granular butter (*b*) made from the cream out of the same vat was taken from the churns and worked up with pats, while samples of similar butter (*c*) were also secured out of the boxes when packed. This series of samples was forwarded to Sydney for examination.

It was found that the butter made in the hand churn (*a*) did not develop the disagreeable smell.

The granular butter (*b*) in every instance but one developed either a bad smell or the typical aroma of decomposition, the exception being that butter which had been very much over-salted to such an extent as to be quite gritty.

The samples of the finished butter (*c*) all developed the typical aroma of decomposition.

The results of these experiments indicated undesirable contamination after the cream left the vat. Flumings, churns, workers, barrows, and other wooden utensils were then subjected to a thorough disinfection—the flumings with a solution of formalin, and the wooden equipment with a hypochloride solution containing 6 ozs. of chloride of lime to 50 gallons of water. The first two consignments of butter forwarded to Sydney after this treatment were free from any sign of the aroma of decomposition, but afterwards the trouble persisted in odd cases, despite similar treatment of the utensils.

The conclusions suggested from the bacteriological examinations were that the particular aroma now under review was due to the combined action of certain putrefying bacteria and *B. coli.* It was also probable that the by-products of this combined bacterial action were produced not only in the manufature of the butter, but also in the grease and moisture which had accumulated about those utensils, and had come in contact with the butter before or at the time of packing. It became apparent that the churns and other wooden equipment had been rendered unsusceptible to effective cleansing treatment by their fat-saturated condition.

New churns and other wooden apparatus were substituted for those in use and from the time of their installation no trace of the disagreeable aroma of decomposition has been noted. The neutralising was as far as could be ascertained being carried out correctly and efficiently. These investigations supply another instance of the importance of maintaining all churns and other necessary equipment in a sanitary condition.

Texture.

The texture of the butter generally during the past season was good, and it was quite uncommon to come across a butter which would be described as badly made. In a number of instances, however, butter has been held up for excess moisture. The incorporation of moisture calls for most careful manipulation, and to be on the safe side accurate moisture tests should be made during the period of each working.

Salting.

Before concluding, a few remarks might be made regarding the salting of butter. Many of our butters during the past season were too lightly salted. Salt is used primarily to brighten the natural flavour. Its preservative properties in butter are practically nil, for its inhibitive action on the growth of germ life is negligible, except in the case of moulds. In support of this latter statement it has been found that in brine used for curing bacon, which would be ever so much stronger than the salt solution present in butter, large counts of bacteria have been identified.

Pasteurisation has a tendency to make a butter rather flat in flavour, especially when comparatively low acidities are aimed at, as is the case in New South Wales. Therefore, it is advisable to use sufficient salt to counteract this effect and to bring up the natural butter flavour to the maximum degree, but care must be taken not to salt too heavily, otherwise the result obtained will be found more unsatisfactory from a flavour point of view than if insufficient salt is used. It is not considered advisable to recommend an increase by any definite percentage, for in many instances salting has been satisfactory and any increase in such cases would result in over-salting. In this connection it is suggested that particular notice should be taken of the grade slips and check grading forms sent out by the Dairy Branch, and where the remarks "flat" or "too lightly salted" are made, a slight increase in the amount of salt added might be made to advantage.

MANURIAL TRIALS WITH BROOM MILLET.

A NUMBER of broom millet experiments were arranged around Coraki on the Richmond River last season, but seasonal conditions were so adverse that the plots were either failures or valueless for comparative purposes.

At Tatham, via Casino, Mr. J. P. McDonnell was somewhat more fortunate as regards situation, and weather at harvesting time. The soil is a heavy black alluvial which had been previously cropped with maize and ploughed in August and September. Thorough cultivation was then given in preparation of the seed-bed for planting. However, the weather remaining dry, planting was not carried out until 24th December. An excellent germination was obtained, and the cultivators were kept moving during the early stages of growth.

The rainfall during the growing period was as follows:—January, 1,320 points; February, 441; March, 408; April, 285; total, 2,454 points.

The results obtained were as follows:—

	cwt.	qr.	lb.
Superphosphate, 2 cwt. per acre at planting, and top-dressed with $\frac{2}{3}$ cwt. nitrate of soda just before the head appeared	9	0	4
Superphosphate, 2 cwt. per acre at planting	7	3	1
No manure	6	3	25

The plots manured with superphosphate at planting were more vigorous and of a healthier and darker green than the unmanured plot. The top-dressing with nitrate of soda just before heading had the effect of forcing the heads out quickly; they were half out on this plot before the heads on the other plots commenced to appear.

The results are of great significance to the millet-growing of the State, for only a few at present use fertilisers. The top-dressing at heading stage with a gentle-acting nitrogenous fertiliser, such as nitrate of soda or sulphate of ammonia, not only markedly increases the yield, but is likely also to much improve the quality in two ways: (1) by forcing the heads out quickly and thus reducing the amount of bent brush, and (2) the rapid exsertion of the brush from the leaf sheath deprives aphis of shelter, and thus ensures greater freedom from the discolouration caused by those insects.—M. J. E. SQUIRE, Agricultural Instructor.

Wood Borers.

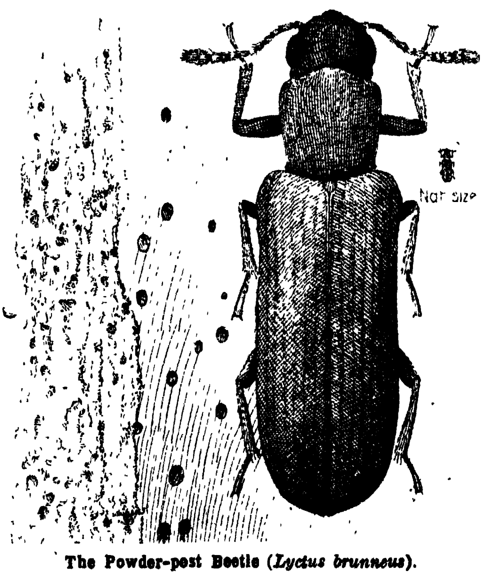
POWDER-POST AND FURNITURE BEETLES.

W. B. GURNEY, B.Sc., Government Entomologist.

IN New South Wales we have two main types of boring beetles, viz., the powder-post beetle (*Lyctus brunneus*), and the furniture beetle (*Anobium domesticum*). For the convenience of those interested in the depredations of these pests this brief note on the method of control is published. The powder-post beetle attacks chiefly the sapwood of hardwood timbers, notably spotted gum. As a rule the damage appears months after the timber is cut, and may show for a year or two later in the sapwood of the timber. As these beetles confine their attention to the sapwood the damage to boards and beams is limited to riddling this portion of the wood and usually does not affect seriously the strength of the timber.

Eradicating Powder-Post Beetle.

The treatment is to drench thoroughly the affected timber and adjacent woodwork by painting with creosote oil, and, as far as practicable, on both sides of the boards. The mixing of kerosene oil and creosote oil, half and half, gives rather better penetration, but the creosote oil penetrates fairly well and lasts longer. While these oils will kill any beetles or their grubs they reach, their chief virtue is in preventing or deterring the adult beetles from returning to lay eggs on the treated boards, though the beetles may emerge from wood after it is oiled. The adult beetles usually emerge about November and December and may be seen crawling over the timber. Treat with oil, therefore, about November, and repeat if necessary the same time the following year. As a rule after two or three years these beetles leave the wood.

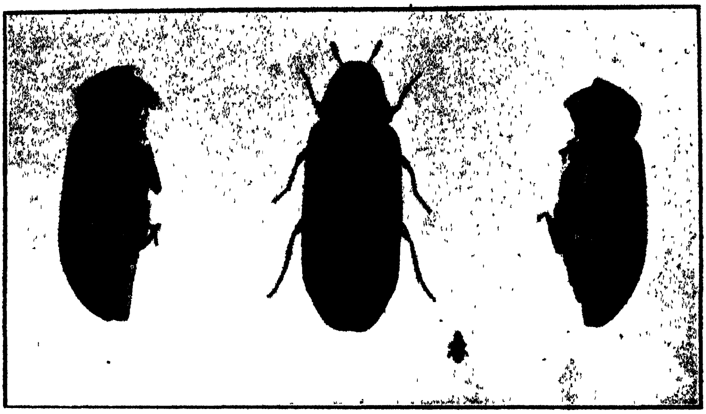


The Powder-post Beetle (*Lyctus brunneus*). Also some damaged woodwork.

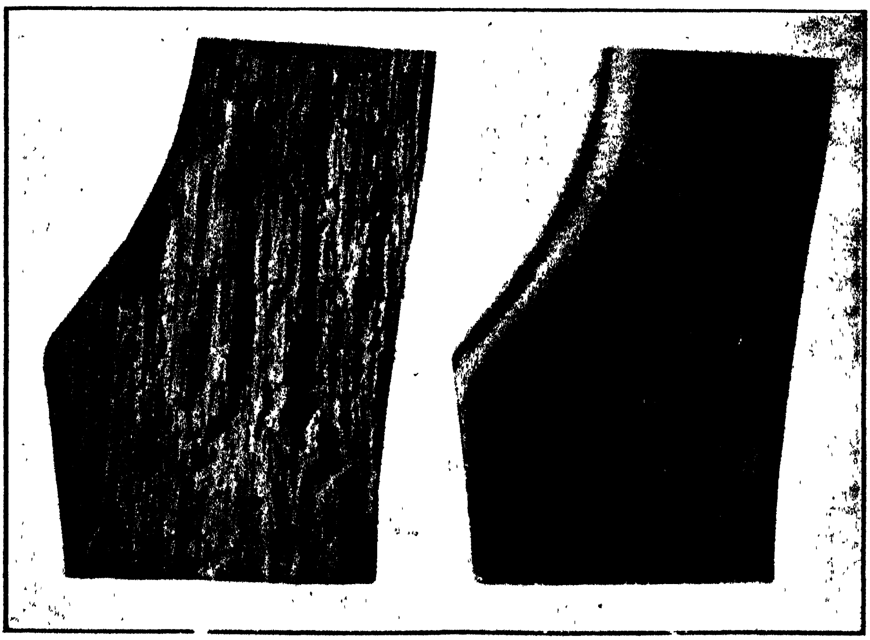
The Furniture Beetle.

The other species, the furniture beetle (*Anobium domesticum*), favours soft or medium soft woods, notably white pine, and is more persistent than the powder-post beetle, reproducing and repeatedly attacking the wood

and spreading readily to adjacent pine wood and furniture. The eggs are laid in pores of the surface, within old bores, and at the rough ends of the boards. Paint, varnish, or oil deters them from re-depositing eggs. The grubs do the boring damage; and though they may emerge through a painted, polished, or oiled surface, they are deterred from again laying eggs except



The Furniture Beetle (*Anobium domesticum*).



Portion of a Chair attacked by Furniture Borers.
Although only two holes appear on the surface, the interior of the wood is seen to be riddled.

by re-entering the emergence holes to do so. Hence oiling, repainting or revarnishing about November is valuable protection, and treatment of adjacent unpainted or untreated woodwork liable to infestation is advised.

When the first emergence holes begin to appear in pianos or valuable furniture, it pays to inject by means of a fine pointed glass syringe, turpentine, or benzine, or creosote oil into these initial holes. Commence immediately the damage is discovered, and repeat daily for a week or two to arrest the outbreak. Varnish, paint, or oil all hidden internal woodwork of wardrobes, shelves, or other furniture showing infestation or likely to be infested.

Finally, where the articles are small enough, or infested panels can be removed for treatment, these may be placed in an oven and treated. Woodwork, an inch thick, if left in a temperature of 175 deg. Fah. for three-quarters of an hour will have the eggs, grubs, and adults killed right out. Longer periods of exposure to the heat are necessary with thicker wood.

Fertiliser Trial with Tomatoes at Griffith.

A fertiliser trial with tomatoes was conducted by Mr. R. D. Westmore at Farm No. 971, Griffith, during 1926-27 season. Plots of one-fourteenth acre each were planted on 11th December, 1926, each plot containing an equal area of Red Stone and San Jose varieties. They were planted in well-prepared land which had previously grown a crop of peas that had been ploughed in in July, 1926. The harvesting of the tomatoes commenced on 7th March and continued until 6th May.

The fertilisers used and the yield obtained were as follows:—

	Yield per acre			
	t.	cwt.	qr.	lb.
No manure	3	8	1	0
Superphosphate, 2½ cwt. per acre	3	15	1	0
P7, 2¼ cwt. per acre	4	4	1	0
P1, 2 cwt. 3 qr. 14 lb. per acre...	4	0	2	0
P10, 3¼ cwt. per acre	3	15	2	0
Basic superphosphate, 3 cwt. per acre...	3	11	3	0
Superphosphate, 2¼ cwt., with sulphate of ammonia, 1 cwt., top-dressed	3	16	0	14

The composition of the mixed fertilisers was as follows:—P7 equal parts of superphosphate and bone dust; P 10, 10 parts superphosphate, 1½ parts of sulphate of ammonia, and 1½ parts of sulphate of potash; P 1, 10 parts superphosphate and 1½ parts sulphate of ammonia.

The season was not a particularly good one for tomatoes, and the yields were only fair and scarcely payable. Apart from lack of rainfall, the atmospheric conditions did not favour production of thrifty and healthy vines.

The increases obtained from fertilisers were not great, but on local factory prices of £6 per ton, P 7 gave an increased gross return of £4 16s., and P 1, £3 15s. per acre. Deducting the costs of these two fertilisers, the net monetary improvement from the use of P 7 was £4 0s. 3d., and from P 1, £2 15s. per acre.

The increase obtained by top-dressing hardly justified that practice.—E. B. Furby, Agricultural Instructor.

Concrete Silo Construction.

[Concluded from page 623.]

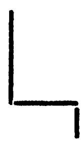
A. BROOKS, Works Superintendent.

Reinforcement.

THE pressure exerted on the walls of a silo is stated to be 11 lb. per square foot to each foot in depth of the silage, consequently in a full silo, 30 feet deep, the pressure against the walls at the bottom is 330 lb. per square foot. To resist this it is necessary to reinforce the walls of concrete silos, and steel rods and wire are used for the purpose, producing what is known as a monolithic structure.

If the silo is set into the ground and the soil is firm, there will be no necessity to put any steel into either the footings or the walls, until the walls are within 18 inches of the ground surface. If, on the other hand, the ground is soft, such as might require drainage, then reinforcement will be necessary all through.

In the footings, short radiating rods, spaced as indicated on Fig. 1, should



be put in, and to take the lower ends of the vertical rods pieces of ⅜-inch rod, shaped as in this figure, should be set into the top of the foundations, and spaced out as indicated. If the short shank of this iron be pushed into the concrete, it will stand up until the concrete is set (see Fig. 3). To the longer shanks, standing over the footing, are tied the bottom ends of the vertical rods, to which the horizontal rods or wires, spaced at 8-inch centres, are tied.

It may be noted that the vertical rods can be put in 8 feet or 10 feet lengths, and passed through a hole bored in each spacing piece, at 2 inches from the outer form, to keep the verticals in their correct position (see Fig. 12).

At each side of the door openings, ½-inch vertical rods are placed, as indicated in Figs. 1 and 2, and the ends of the horizontal wire are securely tied around these. All lapping joints of the horizontal wires or rods should be hooked and laid together.

Setting up the Forms.

Beginning now the construction of the silo itself, the excavation should first be taken out to the depth required to set the silo 4 to 5 feet deep into the ground, with a diameter of about 16 feet, which will allow the walls underground to be at least 8 inches thick. The trench for the foundation should then be taken out as indicated on Fig. 17, which also shows the position of the forms for first and second lifts.

When the concrete in the foundation is sufficiently hard, a ring 14 ft. 6 in. in diameter should be clearly marked out on it, and on this line the plain iron face of the inner forms will be set.

The centre mast, built up of two thicknesses of 4 in. x 2 in. timber, bolted together in convenient lengths, the joints lapping about 2 feet long, may next be set up. It will be secured at the bottom by sinking a few inches into the ground, and at the ground surface to a 6 in. x 3 in. plank, sunk at the ends flush with the surface as indicated in Fig. 17. This mast is continued as the walls are raised, and it forms the support for the inner ends of the cross timbers on which the inside scaffolding rests (see Fig. 3).

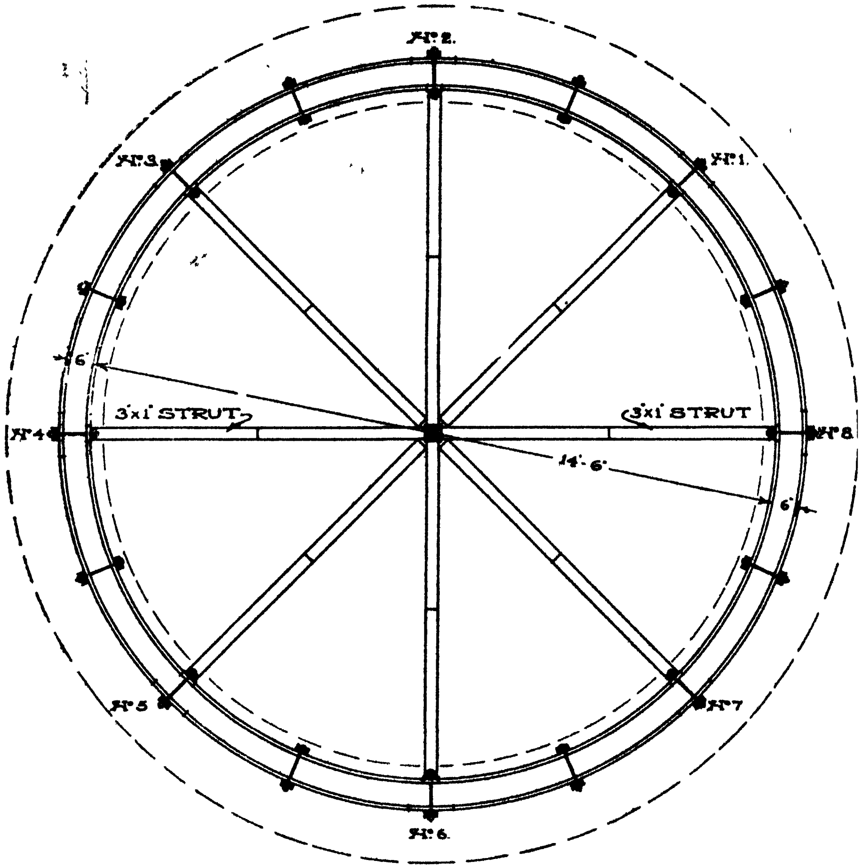


Fig. 16.—Plan showing Lay-out of Complete Set of Corrugated Iron Forms.

To set up the first and second lifts underground, only the inside forms are required, and they are set on the ring marked out on the foundation.

The bottom edges of the forms are secured by the ends of 3 in. x 1 in. battens, laid on the floor, and against the centre mast (see Fig. 16). On these battens, shorter pieces are nailed, to which are butted the lower ends of the stays securing the top edges of the forms. Great care must be taken to have the first forms set perfectly upright (plumb).

The second lift, rising to the bottom of the 6 in. x 3 in. plank across the silo and to which the centre mast is secured, is held in position with stay battens in a way similar to the first lift (as indicated at the second lift in Fig. 17), battens cut to the required lengths being set up under the forms to support them to the required height.

When filling the concrete into the second lift, it will be necessary to fill only to 4½ inches from the top of the forms, to allow for the setting up of the outer sides of the forms, which, it will be noted, will rest on top of the concrete at 4½ inches down. When the outer forms are thus set up, the concrete may be filled to the top of the inner forms. This last filling of the concrete must be allowed to set before the inner forms can be raised to the same height as the outer forms. When this is done, no other support to the forms will be required, except the long bolts which tighten the lower edges over the concrete, and the top edges to the spacing pieces.

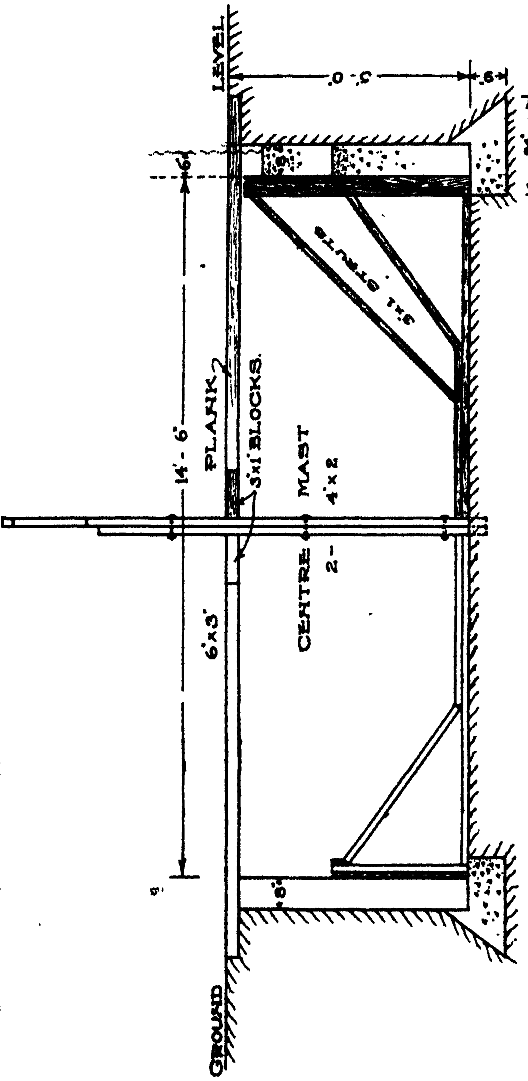


Fig. 17.—Section of Underground Construction, showing Forms held in position by Struts. On the left, the first "lift," of the forms; on the right, the second "lift."

Door Forms.

The forms for the doorways can be made from 4 in. x 2 in. timber, in two separate parts, and fixed one over the other as indicated in Fig. 18. These frames are shaped on the out and inside faces to fit fairly close up to the iron forms, and when removed leave a 2 in. x 2 in. rebate on the sides and top to receive the ends and top of the 12 in. x 2 in. door planks, the bottom or sill being flat until it is sloped off, as shown in Fig. 3, with cement mortar.

To better exclude the air at the door openings, a strip of tar paper 36 inches wide is spread over the planks, before the silage is packed against the doors. Any crack or open joints outside can be pointed up with puddled clay.

The Internal Scaffolding.

As construction proceeds it will become necessary to provide an internal scaffolding. This can be done, as shown in Fig. 3, with 3 in. x 2 in. hardwood putlogs or ledgers, bolted or tied to the centre mast, and 1½ in. x ⅜ in. pieces of flat wrought iron 12 inches long, bolted to the other ends, the irons only

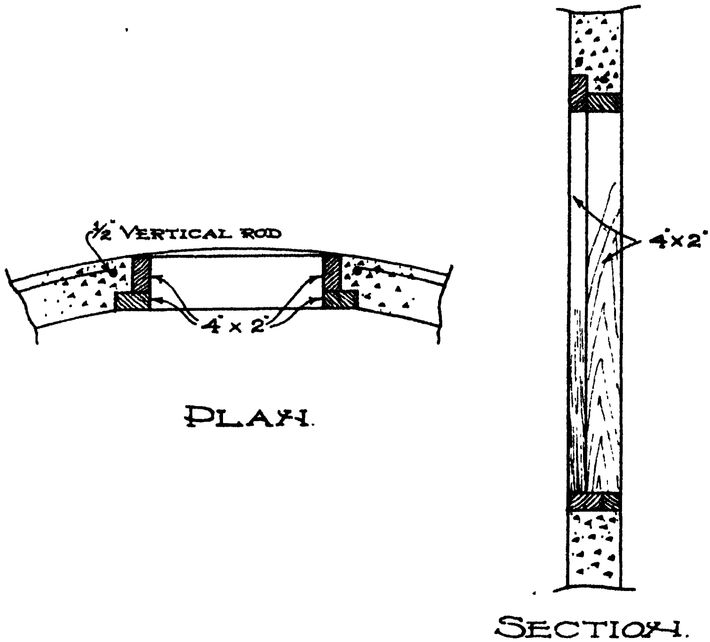


Fig. 18.- Details of Frame for Forming Door Openings.

set 2 inches into the concrete walls. The outer ends of the 3 in. x 2 in. timbers should butt against the silo walls, as this keeps the centre mast in a perpendicular position.

To provide the holes in the concrete to receive the iron plates mentioned above, it will be necessary to insert pieces of iron or wood in the concrete as it is being filled into the moulds, these pieces to be taken out when the scaffolding is being fixed.

The Roof.

The roof over the silo should be constructed to provide good shelter, and at the same time permit of the silo being filled to its utmost capacity. This cannot be done when the roof is set close down on to the walls, but if it is erected on poles set up outside the area of the silo and sufficiently high, not only is plenty head-room provided, but, if erected before the concrete work is

commenced, the poles can be used to support the external scaffolding, and the roof timbers used to sling the pulley block for hauling up the concrete bucket, &c.

To give it good appearance both gables should be enclosed, and in one gable an opening provided to admit the head of the elevator (see Fig. 3).

Where a blower fan and pipe is used on the cutter, this opening is not necessary, as the bend on the head of the pipe simply lies on the wall at one side of the doors.

Ladder.

A hanging ladder made of 3 in. x 2 in. sides, with 2 in. x $\frac{3}{4}$ in. rungs sunk flush in the edges, and further secured with a length of light hoop iron the full length of the sides and fixed over the rungs, provides a very convenient means of climbing to the doors or over the top of the silo.

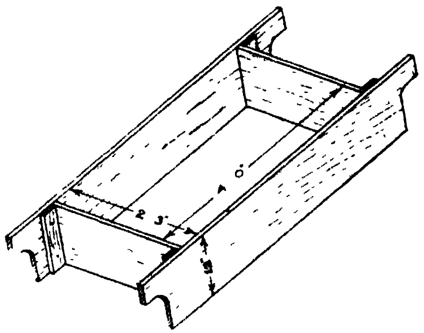


Fig. 19.—Sketch of Gauging Box for Mixing Concrete.

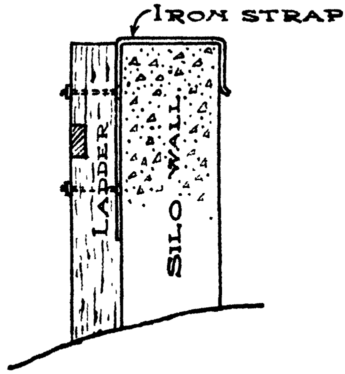


Fig. 20.—Detail of Top of Ladder.

The $1\frac{1}{2}$ in. x $\frac{1}{2}$ in. wrought iron hooks, shown on Fig. 20, if bolted to the ladder make it very safe to use, and, as will be noted, it may be placed anywhere around the silo.

A Few Points to Remember.

With all building works constructed of units such as stone, bricks, or concrete blocks, the units must not be dry when set in position, more especially in summer weather and when cement mortar is being used, because the stone, brick, or block in its dry state readily absorbs the moisture out of the mortar, and causes it to dry out much too quickly.

A good plan is to keep the stones, bricks, or blocks well watered, or in a tub of water, so that they shall not dry when passed on to the scaffold.

When plastering the walls, or even if only applying a coat of cement wash, the surface of the wall should first be well wetted, the water being either brushed on or sprinkled through a hose. This stops the suction in the wall and allows the plaster or wash to set slowly and harden on. If the wetting is not first done, the cement wash will easily rub off when dry.

When bending the reinforcing wires round on the bed joints of a brick or block silo, weight them down at several points around the wall to keep them in correct position, and slightly raise the wire as the mortar is spread on, so that the wire shall be properly embedded in the joint. Do not neglect to keep the water supply up to the work in all cases, as much of the strength of the whole work depends on this.

When building solid walls always keep the face of the forms clean, and each time they are shifted, carefully rub down the face of each section. Should the concrete show any tendency to stick, smear the face of the forms with oil or grease. This also should be done when the forms are being laid away for future use. All bolts should be kept well oiled, especially at the threaded ends, so that the nuts will turn easily.

If forms are made of timber, and not faced with iron, the face should be painted before they are used for the first time. This applies also to door forms.

The Reserve Power of the Horse

Horses have the advantage of being immediately adaptable to all conditions; they can be used on wet, soft, and boggy country, and then proceed along a macadamised road. The flexibility of the horse is marvellous, and in this he has a distinct advantage over the motor. For short distances the horse can develop a power several times as great as its normal working power. For this reason he can pull through clay bogs, climb steep hills, and successfully deal with all sorts of emergencies. On the farm the horse looks after its own repairs and renewals— the cost of which to the owner is infinitesimal. —J. F. McEachran, M.R.C.V.S.

Co-operative Development in the United States.

It is estimated that in 1900 there were approximately 2,000 farmers' business organisations functioning in the United States. Between 1900 and 1925 the number of active associations increased to about 12,000, and the purposes for which associations existed also increased.

At the close of 1925 there were approximately 12,000 functioning associations, including 40 federations, 80 centralised associations, 35 sales agencies, 50 bargaining associations, and nearly 10,000 independent local associations.

The number of associations marketing dairy products increased from 1,600 to 2,200; the number of associations handling grain from 100 to 3,400; the number of livestock shipping associations from less than 100 to 1,800; fruit and vegetable marketing associations from 100 to 1,300. There were also formed nearly 100 associations for marketing wool, and 70 marketing poultry and poultry products.

It is reasonable to assume that the business done in 1900 amounted to less that 200,000,000 dollars. This figure is significant in comparison with 2,400,000,000 dollars which is the estimated amount of business by farmers' associations for 1925. The 1900 figure is even more significant in the light of the fact that several of the present-day associations report sales of more than 50,000,000 dollars a year.—*News Bulletin* of the Markets and Migration Department (Federal).

Trials With Water Melons.

J. DOUGLASS, H.D.A., Agricultural Instructor.

THE popularity of this fruit can to some extent be judged by the endeavour of practically all farmers to grow it, if not for market, at least for home use.

On the rich flats of the coastal rivers the crop is of great importance, large areas being planted for market, and on the Hawkesbury and Hunter Rivers melons are looked upon as one of the main crops. During the season 1924-25, 104 acres of pumpkins and melons were grown in the Penrith and Richmond districts, and 431 acres in the Maitland district. The soil and climatic conditions in these areas are practically ideal, the soil being a deep alluvial loam, rich in organic matter, well drained, and naturally warming up early. These districts have a long period free from frost, and are not subject to sudden changes in temperature during the growing period.

The varieties grown are numerous, and at the present time are practically all accidentally cross-pollinated. The market demands change periodically, owing to the degeneration of certain popular varieties and the introduction of new ones. On the Sydney market there is a keen demand at present for a melon with a light green or grey skin, the melon which created this demand being the "Sugar Stick." The Hunter River farmers nearly all grow "Florida Favourite," although other varieties receive attention.

The object of all water melon growers is to place the melons on the market as early as possible, as prices fall rapidly once the crop begins to come forward. Hawkesbury growers use various fertiliser mixtures with some success, but none has been used in general cultivation on the Hunter. Providing the type is reasonably suitable for market, the earliest maturing varieties are generally grown.

The Department of Agriculture conducted experiments during the past season with the object of ascertaining the most suitable varieties of melons to grow, and the effect of fertilisers on the crop. Mr. G. Townsend, of Penrith, conducted a variety trial, and Mr. A. R. Meade, of Bolwarra, conducted a manurial trial.

Fertiliser Trial.

It is recognised that melons do best on alluvial flats after a crop of lucerne. The flat on which this trial was conducted had been under lucerne for six years and the residue of a lucerne stand was ploughed under 6 inches deep in June, 1926. During July reploughing 10 inches deep was carried out with a disc plough. The land was finally shallow-ploughed with a mouldboard plough, and reduced to a fine seed-bed by harrowing. Previous to planting, which took place on 8th September, 1926, the fertiliser was worked into and around the hills, and owing to the very dry conditions

prevailing at seeding time, each hill was lightly watered. There was very little difference in the growth of the plots until fruiting commenced, when it was seen that the superphosphate and basic superphosphate plots were producing the earliest melons. The season throughout was bad for summer vine crops, the rains coming too late to ensure large or early yields. The first melons from the experimental plot were marketed on 16th February, bringing 11s. 6d. per dozen. A table of results is given below.

A study of the table shows that P7 (a mixture of equal parts of bonedust and superphosphate) produced the highest yield and best monetary return. The value of this mixture lies in the fact that the superphosphate is readily available to the plant in the early stages of growth, while the bonedust becomes available slowly and has a greater effect on the crop in the later stages. The table is divided into three sections, showing the numbers of melons and their comparative values in the early, mid-season and late stages of growth. The prices given are those actually realised. In normal

Mammoth Ironclad Water Melon.

years the prices obtained for the early melons are much higher than the price given, while the late crop is usually cheaper and of little value. Hence, to obtain a more correct valuation of the effect of the different fertilisers a close study should be made of the first section of results. It will be seen that basic superphosphate easily produced the best returns for early melons, and would in normal years be the best paying fertiliser to use. There was no difference in the date of ripening of the superphosphate and basic superphosphate plots, although basic superphosphate produced the greatest number of early melons.

Variety Trial.

The object of this trial was to ascertain the best yielding varieties, and to study the quality and other variety characteristics.

The varieties under test were Mammoth Ironclad, Rattlesnake, Irish Grey, Improved Kleckley Sweet, Thorman's Grey, and Alabama Sweet.

From a yielding point of view, the test was destroyed quite early in the growing period, owing to the large numbers of plants killed by fusarium. However, sufficient plants were left for a study of the quality, and to afford an indication of the comparative yield of each variety.

Mammoth Ironclad.—This variety appears to be the best yielder, the fruit being conspicuously marked and very large. The quality of the fruit is very poor, the rind being thick and the flavour and colour of the flesh only fair. The thickness of the rind makes this variety a good carrier. The skin is light green in colour, with deep green conspicuous broken stripes. The seed of this variety has a brown tip.

Rattlesnake.—Only medium in size, long, with the flower end tapering off; the quality is excellent throughout, the flesh is of good colour and sweet flavour. The seeds are white and the fruit is a poor carrier. The skin is very light green in colour, with vividly spaced, dark green broken stripes.

Irish Grey Water Melon.

Irish Grey.—This variety is very conspicuous by the plain, unbroken, light coloured skin. The fruit is long, oval in shape, and medium in size. The quality and colour of the flesh is good, and the seeds white. Although the rind in this melon is exceptionally thin, the skin is very hard and the variety one of the best of carriers. Owing to the hardness of the skin a good deal of difficulty is experienced in judging when the melon is ripe. This variety is one that has a good future before it, as it has many desirable qualities, and once known can be easily distinguished by the uncommon skin.

Thorman's Grey.—The fruit of this variety is medium to large in size, and rather long in shape. The skin has a wide netted appearance, the background colour of which is light green. The rind is medium in thickness, and the flesh sweet and of good colour. The seeds are white in colour.

Alabama Sweet.—This is one of the best yielding varieties, and is medium to large in size. The skin is very dark in colour and striped. The flesh is of excellent colour, sweet, and of good quality. The seeds are white and the fruits should be fairly good shippers.

Improved Kleckley Sweet.—A long, dark green oval melon, medium to large in size; the flesh is sweet and high in colour; only a fair carrier.

RESULTS of Fertiliser Trial at Bolwarra.

	Superphosphate 280 lb. per acre.		Basic superphosphate 326 lb.		M13, 364 lb.		No manure.		P3, 448 lb.		Blood and bonedust 280 lb.		P7 252 lb.	
	No. of melons per acre.	Value per acre.	No. of melons per acre.	Value per acre.	No. of melons per acre.	Value per acre.	No. of melons per acre.	Value per acre.	No. of melons per acre.	Value per acre.	No. of melons per acre.	Value per acre.	No. of melons per acre.	Value per acre.
Melons at—		s. d.		s. d.		s. d.		s. d.		s. d.		s. d.		s. d.
11s. 6d. per dozen ...	78	74 9	86	82 4	48	46 0	41	39 4	60	57 6	28	26 10	63	60 4
5s. per doz.	115	48 1	48	20 0	152	63 4	30	12 6	102	42 6	96	40 0	148	61 10
4s. ,, ...	66	22 0	87	29 0	98	32 8	156	52 0	...	...	156	52 0	106	35 4
Total ...	259	144 10	221	131 4	298	142 0	227	103 10	162	100 0	280	118 10	317	157 6

Fertiliser mixture M13, consists of 10 parts superphosphate and 3 parts sulphate of potash; P3 consists of 10 parts superphosphate, 3 parts sulphate of potash, and 3 parts sulphate of ammonia; P7, equal parts superphosphate and bonedust.

STORAGE OF SEED POTATOES.

WHEN it is remembered that potatoes are living tubers which must breathe and respire in order to remain alive, and that chemical changes are constantly taking place within their tissues, it will be realised that they should be regarded as living but dormant plants rather than as ordinary seed, and that methods of storage which are suited to the latter are quite unsuitable for potatoes. —H. C. ARNOLD, in the *Rhodesia Agricultural Journal.*

HEAVY MILK PRODUCTION REQUIRES A ROBUST CONSTITUTION.

To stand up to the strain of heavy dairy production a strong, robust constitution is one of the essentials needed. Much of the dairy cow's time in daylight when she might otherwise be feeding is taken up in and about the bails or yards and travelling backwards and forwards to the pastures, and as compared with fattening stock she is under a big disadvantage in this respect. Then, again, when in times of severe drought the feed is dried off by the great heat and practically disappears, the heavy-milking cow will, for a time, draw on her reserve forces to supply milk, to the certain detriment of her constitution.—J. T. COLE, at the Animal Husbandry Conference.

The Codling Moth.

(*Cydia pomonella* L).

PART II.

[Concluded from page 631.]

S. L. ALLMAN, B.Sc.Agr., Assistant Entomologist.

Pupæ of the First Brood.

Time of pupation.—The first pupa occurred on 4th December, the last on 3rd February, and the maximum number on 13th January. Fig. 5 illustrates the pupation of 665 individuals.

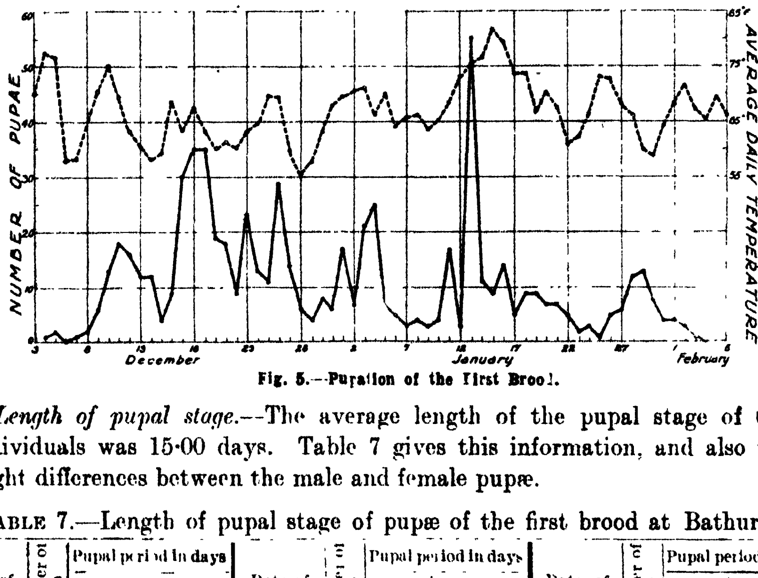


Fig. 5.—Pupation of the First Brood.

Length of pupal stage.—The average length of the pupal stage of 633 individuals was 15·00 days. Table 7 gives this information, and also the slight differences between the male and female pupæ.

TABLE 7.—Length of pupal stage of pupæ of the first brood at Bathurst.

Date of Pupation	Number of pupæ	Pupal period in days: Average.	Maximum	Minimum	Date of Pupation	Number of pupæ	Pupal period in days: Average	Maximum	Minimum	Date of Pupation	Number of pupæ	Pupal period in days: Average	Maximum	Minimum
4 Dec. ..	1	14·00	14	14	26 Dec. ..	28	15·07	16	13	16 Jan. ..	13	15·23	18	13
5 " ..	2	15·50	16	15	27 " ..	14	15·64	18	14	17 " ..	5	15·00	16	14
7 " ..	1	16·00	16	16	28 " ..	6	15·83	18	15	18 " ..	9	16·56	18	15
8 " ..	1	16·00	16	16	29 " ..	4	14·25	15	14	19 " ..	9	15·78	17	14
9 " ..	6	15·83	16	15	30 " ..	8	13·50	14	12	20 " ..	7	16·43	17	16
10 " ..	13	16·85	20	16	31 " ..	6	13·67	14	13	21 " ..	6	16·50	17	16
11 " ..	17	17·35	20	16	1 Jan. ..	17	13·53	15	13	22 " ..	5	15·60	17	14
12 " ..	16	17·94	20	15	2 " ..	7	13·71	15	13	23 " ..	2	16·50	17	16
13 " ..	12	18·58	20	17	3 " ..	21	13·19	15	12	24 " ..	3	15·33	16	15
14 " ..	9	18·44	20	17	4 " ..	25	13·28	15	12	25 " ..	1	15·00	15	15
15 " ..	4	18·00	19	17	5 " ..	7	13·43	14	12	26 " ..	5	15·20	16	14
16 " ..	8	17·25	19	16	6 " ..	5	13·60	14	13	27 " ..	4	14·50	15	14
17 " ..	29	16·31	18	15	7 " ..	3	14·67	16	14	28 " ..	10	14·90	16	14
18 " ..	32	16·25	18	15	8 " ..	4	14·00	15	13	29 " ..	12	14·08	15	13
19 " ..	33	15·88	17	15	9 " ..	3	14·67	15	14	30 " ..	5	13·80	14	13
20 " ..	17	15·53	16	14	10 " ..	4	12·25	14	9	31 " ..	3	13·33	14	13
21 " ..	17	15·41	16	14	11 " ..	17	13·24	15	11	1 Feb. ..	4	13·75	14	13
22 " ..	9	15·00	17	14	12 " ..	3	14·00	14	14	2 " ..	3	14·33	17	11
23 " ..	22	14·59	16	13	13 " ..	54	12·44	15	11	3 " ..	1	14·00	14	14
24 " ..	13	15·15	16	14	14 " ..	11	13·64	15	12					
25 " ..	8	14·63	16	12	15 " ..	9	13·67	16	12	Total	633	15·00	20	9

Average pupal period, male pupæ, 14·89 days; female pupæ, 15·04 days.
Maximum pupal period, male pupæ, 20 days; female pupæ, 20 days.
Minimum pupal period, male pupæ, 9 days; female pupæ, 11 days.

Moths of the First Brood.

Time of emergence.—The earliest first brood moth emerged on 18th December, or twenty-two days before the last emergence of the spring brood moths. First brood moths continued to emerge until 19th February, the maximum emergence occurring on 4th January. The emergence of 634 first brood moths is illustrated in Fig. 6 (page 701).

Oviposition by moths of the first brood.—Oviposition records were obtained from 492 moths. Egg deposition began the day following emergence in many cases, but the average pre-oviposition period was 3·25 days The interval to maximum oviposition was 7·45 days and to last oviposition 15·30 days. The period of oviposition was 12·43 days, which included also the two jars (36 and 32) in which no oviposition occurred. This data is shown in Table 8, and is for jars and not for individual moths.

TABLE 8.—Oviposition by codling moths of the first brood in breeding jars at Bathurst.

Observation.	Number of Moths.	Sex		Date of—				Number of days—				Total number of eggs.
		Male.	Female.	Emergence.	First Ovi-position.	Maximum Ovi-position.	Last Ovi-position.	Before Ovi-position.	From emergence to Maximum Oviposition.	Of Ovi-position.	From emergence to last Oviposition.	
1	9	6	3	26 Dec .	29 Dec.	30 Dec.	7 Jan.	3	4	10	12	75
2	12	4	8	27 ,, ...	30 ,,	2 Jan	5 ,,	3	6	7	9	67
3	10	5	5	29 ,, ..	31 ,,	1 ,,	12 ,,	2	3	13	14	15
4	9	4	5	30 ,, ..	31 ,,	2 ,,	6 ,,	1	3	7	7	178
5	9	4	5	31 ,, ...	3 Jan.	3 ,,	18 ,,	3	3	16	18	77
6	18	9	9	1 Jan .	2 ,,	2 ,,	18 ,,	1	1	12	12	112
7	20	11	9	2 ,, ..	4 ,,	5 ,,	17 ,,	2	3	14	15	407
8	18	9	9	3 ,, ..	4 ,,	9 ,,	20 ,,	1	6	17	17	364
9	19	12	7	4 ..	6 ,,	14 ,,	24 ,,	2	10	19	20	296
10	23	13	10	5 ,, .	8 ,,	15 ,,	24 ,,	3	10	17	19	477
11	12	4	8	6 ,, ..	9 ,,	15 ,,	25 ,,	3	9	17	19	282
12	9	5	4	7 ,, .	9 ,,	16 ,,	16 ,,	2	9	8	9	8
13	14	10	4	8 ,, ...	9 ,,	15 ,,	24 ,,	1	7	16	16	140
14	16	7	9	9 ,, .	11 ,,	20 ,,	25 ,,	2	11	15	16	108
15	10	4	6	10 ,, ..	13 ,,	17 ,,	18 ,,	3	7	6	8	9
16	17	8	9	11 ,, ..	12 ,,	18 ,,	31 ,,	1	7	20	20	31
17	10	2	8	12 ,, .	13 ,,	15 ,,	5 Feb	1	3	24	24	101
18	12	8	4	13 ,, ...	17 ,,	24 ,,	24 Jan	4	11	8	11	10
19	15	10	5	14 ,, .	15 ,,	26 ,,	29 ,,	1	12	15	15	159
20	12	8	4	15 ,, .	17 ,,	26 ,,	30 ,,	2	11	14	15	91
21	18	9	9	16 ,, ..	18 ,,	20 ,,	4 Feb.	2	4	18	19	659
22	19	12	7	17 ,, ..	20 ,,	23 ,,	5 ,,	3	6	17	19	304
23	9	6	3	18 ,, ..	20 ,,	25 ,,	2 ,,	2	7	14	15	214
24	9	4	5	19 ,, ...	22 ,,	26 ,,	6 ,,	3	7	16	18	54
25	5	2	3	22 ,, ..	29 ,,	9 Feb.	12 ,,	7	18	15	21	43
26	7	3	4	23 ,, .	25 ,,	26 Jan	6 ,,	2	3	13	14	222
27	14	10	4	24 ,, ...	29 ,,	1 Feb.	4 ,,	5	8	7	11	68
28	15	8	7	25 ,, ...	28 ,,	2 ,,	14 ,,	3	8	18	20	28
29	21	15	6	26 ,, .	2 Feb	2 ,,	7 ,,	7	7	6	12	11
30	12	5	7	27 ,, ...	30 Jan	4 ,,	16 ,,	3	8	18	20	129
31	5	2	3	28 ,, ..	2 Feb	4 ,,	11 ,,	5	7	10	14	122
32	9	5	4	29 ,, ..	...	...	.....	...	...	...	...	0
33	6	3	3	31 ,, ...	2 Feb	2 Feb.	15 Feb.	2	2	14	15	170
34	8	3	5	2 Feb....	5 ,,	14 ,,	17 ,,	3	12	13	15	17
35	5	3	2	3 ,, ..	18 ,,	18 ,,	23 ,,	15	15	6	20	14
36	7	3	4	4 ,, ...	...	.....	......	..	...	...	...	0
37	6	4	2	6 ,, ...	18 Feb.	18 Feb	18 Feb.	12	12	1	12	5
38	5	2	3	7 ,, ...	10 ,,	17 ,,	17 ,,	3	10	8	10	7
39	5	2	3	9 ,, ...	12 ,,	16 ,,	24 ,,	3	7	13	15	116
40	10	3	7	11 ,, ..	15 ,,	19 ,,	2 Mar.	4	8	16	19	169
41	10	5	5	12 ,, ...	14 ,,	18 ,,	26 Feb.	2	6	13	14	898
42	13	9	4	13 ,, ...	16 ,,	20 ,,	26 ,,	3	7	11	13	148
	Average	..	...	..	...	...	...	3·25	7·45	12·43*	15·30	...
	Maximum	...	...	...	...	...	...	15	18	24	24	...
	Minimum	...	...	..	...	...	...	1	1	0	7	...

* Including jars 32 and 36.

Number of male moths, 261; number of female moths, 231; total number of moths, 492; total number of eggs, 5,895; average number of eggs per female moth, 25·52; maximum number of eggs per cage per female moth (41), 78·60.

Number of eggs per female moth.—As shown in Table 8, 231 female moths deposited 5,895 eggs, or an average of 25·52 eggs per female. The maximum average per female per jar occurred in jar 41, five females depositing 393 eggs, or an average of 78·6 eggs per female.

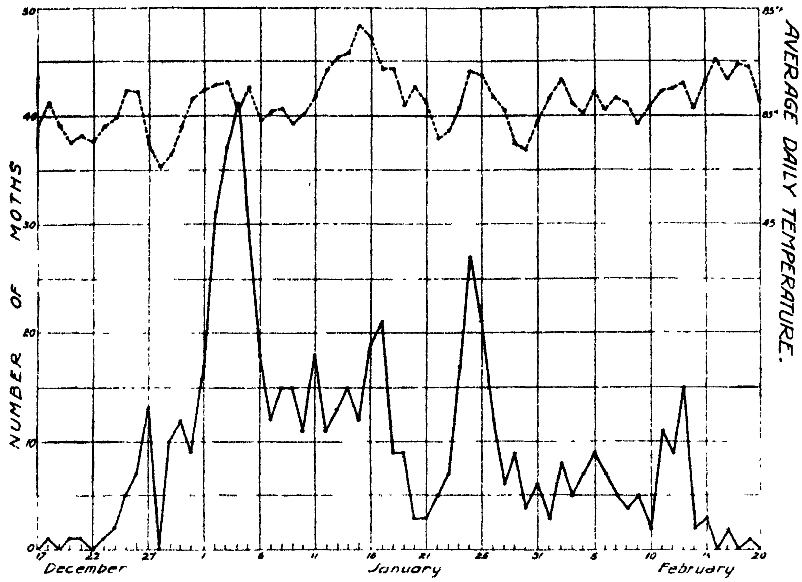


Fig. 6.—Emergence of First-brood Moths.

Length of life of moths.—Male moths lived an average of 16·72 days; females 16·86 days. This and other data are given in Table 9.

TABLE 9.—Length of life of male and female moths of the first brood at Bathurst.

Male.		Female.		Male.		Female.		Male.		Female.	
Length of Life.	Moths.	Length of Life.	Moths.	Length of Life.	Moths.	Length of Life.	Moths	Length of Life.	Moths	Length of Life.	Moths
Days.	No.	Days.	No.	Days.	No	Days.	No.	Days.	No.	Days.	No
4	1	4	1	16	15	16	21	27	4	27	2
5	2	5	...	17	14	17	20	28	2	28	5
6	8	6	1	18	13	18	22	29	2	29	1
7	8	7	4	19	12	19	15	30	2	30	2
8	12	8	5	20	23	20	9	31	3	31	3
9	9	9	4	21	9	21	15	32	2	32	...
10	14	10	14	22	14	22	10	33	3	33	.
11	14	11	9	23	7	23	12	35	1	35	...
12	13	12	12	24	6	24	6	36	2	36	..
13	19	13	20	25	3	25	1	37	1	37	.
14	17	14	13	26	7	26	2	46	1	46	...
15	12	15	13								

Average length of life o fmale moths 16·72 days; female moths 16·86 days.
Maximum length of life of male moths 46 days, female moths 31 days.
Minimum length of life of male moths 4 days; female moths 4 days.

Life Cycle of the First Generation.

The average life cycle of 114 individuals was 62·69 days, the maximum 100 days, and the minimum 52 days. The complete life cycle would be 66·91 days, which includes the average pre-oviposition period of 4·22 days. Table 10 gives further details of the various stages.

TABLE 10.—Life cycle of the first generation at Bathurst.

Date of egg deposition.	Number of individuals.	Incubation of eggs.	Larval feeding period.			Cocooning period.			Pupal period.			Life Cycle.*		
			Average.	Maximum.	Minimum.	Average	Maximum	Minimum	Average	Maximum.	Minimum	Average.	Maximum	Minimum.
		days.	days.	days.	days	days.	days.	days.	days.	days.	days.	days.	days	days.
29 Oct.	4	12	29·50	33	28	18·50	43	4	17·25	19	14	77·25	100	63
31 „	2	12	25·00	27	23	6·00	7	5	19·50	20	19	62·50	63	62
1 Nov.	9	12	25·67	29	23	5·56	8	3	18·00	20	16	61·22	64	58
2 „	5	12	28·00	29	22	10·60	26	5	16·60	18	14	67·28	81	57
8 „	7	10	26·86	31	24	13·86	32	7	15·57	18	14	66·29	87	57
9 „	7	11	28·14	32	23	17 14	37	8	15 00	17	13	71·29	89	60
10 „	1	11	31·00	31	31	9·00	9	9	14 00	14	14	65·00	65	65
12 „	8	10	28·75	40	23	6·38	8	4	14·88	16	13	60·00	67	54
15 „	5	11	30·80	36	27	11·80	20	7	14·00	15	13	67·60	71	59
16 „	3	11	32·23	37	28	7·33	8	7	13·67	14	13	64 33	69	59
19 „	4	9	31·00	35	28	10·00	15	7	14·00	14	14	64·00	69	59
20 „	4	9	29·75	32	28	10·75	23	6	14·25	17	13	63·75	77	58
21 „	1	9	27·00	27	27	7 00	7	7	13·00	13	13	56·00	56	56
25 „	2	7	28·00	28	28	5 00	5	5	13·00	13	13	53·00	53	53
29 „	2	8	30 00	33	27	7 50	9	6	15·00	16	14	60·50	63	58
30 „	5	9	32 00	35	29	7 40	13	5	15 00	16	13	63·40	73	58
1 Dec.	2	8	36 00	36	36	4·50	5	4	17 00	18	16	65·50	66	65
2 „	3	8	32 00	33	30	4·67	6	4	14·67	16	14	59 33	61	58
3 „	3	8	35·00	37	33	5·00	6	4	16·00	18	14	64·00	67	61
4 „	7	8	34·00	38	32	5·00	6	4	16 00	17	15	63·00	67	59
5 „	12	8	30·67	33	28	4·00	5	3	13·75	17	12	56·42	62	52
7 „	2	10	29·50	32	27	5 50	8	3	15 00	16	14	60 00	66	54
8 „	6	10	27·50	29	27	5·50	8	3	15 50	16	14	58·50	63	54
10 „	7	12	25·29	27	24	5·00	7	4	15·71	17	15	58·00	61	55
11 „	1	12	25 00	25	25	5 00	5	5	16 00	16	16	58 00	58	58
13 „	2	13	23·00	24	22	9 50	14	5	15·50	17	14	61 00	68	54
	114	10†	29·24	40	22	8 10	43	3	15·36	20	12	62·69	100	52

* Add 4 22 days for complete life cycle. † Average.
Average life cycle of 58 male moths, 63·05 days; 56 female moths, 62·32 days.

THE SECOND GENERATION.

Eggs of the Second Brood.

Time of deposition.—The earliest second brood eggs were deposited on 29th December, and oviposition continued until 2nd March. The maximum deposition occurred on 20th January. Fig. 7 (see page 704) illustrates the deposition of the second brood eggs, and the influence of the average evening temperature on oviposition.

Length of incubation.—The average incubation period was 8·11 days, somewhat shorter than the average incubation period of first brood eggs, due mainly to increased temperatures. This and other data on the germinal changes of the eggs are given in Table 11.

TABLE 11.—Time of deposition and length of incubation of eggs of the second brood at Bathurst.

Date of Deposition.	Number Eggs	Number of days from deposition to appearance of— Red Ring. Average.	Red Ring. Maximum.	Red Ring. Minimum.	Black Spot. Average.	Black Spot. Maximum	Black Spot. Minimum	Incubation period in days Average.	Incubation period in days Maximum.	Incubation period in days Minimum.
30 December ..	15	2·00	2	2	6·00	6	6	7·00	7	7
31 ,, ...	3	2·00	2	2	.	..	..	..	...	..
1 January ...	4	..	.	..	.	..	...	.	...	...
2 ,, ..	27	2·00	2	2	7·00	7	7	8·96	9	8
3 ,, ..	10	5·00	5	5	8·00	8	8	9·00	9	9
4 ,, .	27	2·00	2	2	8·00	8	8	9·00	9	9
5 ,, .	25	3·00	3	3	8·00	8	8	9·00	9	9
6 ,, ...	4	..	..	...	.	...	...	...	..	..
7 ,, ...	23	2·00	2	2	7·00	7	7	8·00	8	8
8 ,, ...	35	3·00	3	3	6·00	6	6	7·00	7	7
9 ,, ..	36	3·00	3	3	5·00	5	5	6·33	7	6
10 ,, ..	23	3·00	3	3	5·00	5	5	6·00	6	6
11 ,, .	66	2·00	2	2	5·00	5	5	6·00	6	6
12 ,, .	76	3·00	3	3	5·00	5	5	6·00	6	6
13 ,, .	69	2·00	2	2	5·00	5	5	6·00	6	6
14 ,, .	27	1·93	2	1	5·00	5	5	6·00	6	6
15 ,, .	113	2·00	2	2	6·00	6	6	7·22	8	6
16 ,,	31	3·00	3	3	7·00	7	7	8·00	8	8
17 ,, .	34	3·00	3	3	7·92	8	7	8·92	9	8
18 ,,	45	3·00	3	3	8·00	8	8	9·00	9	9
19 ,,	2				..	.	..			
20 ,,	64	4·00	4	4	7·00	7	7	8·00	8	8
21 ,,	17	6·00	6	6	7·00	7	7	9·00	9	9
22 ,, .	15	6·00	6	6	7·00	7	7	9·00	9	9
23 ,, ..	63	5·00	5	5	7·00	7	7	9·00	9	9
24 ,,	35	2·00	2	2	7·00	7	7	9·00	9	9
25 ,,	17	4·00	4	4	8·00	8	8	9·00	9	9
26 ,, .	64	5·00	5	5	8·00	8	8	9·00	9	9
27 ,, .	25	3·00	3	3	8·00	8	8	9·00	9	9
28 ,, ..	16	4·00	4	4	8·00	8	8	9·00	9	9
29 ,, .	12	4·00	4	4	7·92	8	7	8·92	9	8
30 ,,	4	4·00	4	4	7·00	7	7	8·00	8	8
31 ,,	8	2·00	2	2	7·00	7	7	8·00	8	8
1 February .	20	2·00	2	2	7·00	7	7	8·00	8	8
2 ,,	33	3·00	3	3	7·00	7	7	8·00	8	8
3 ,, .	1	3·00	3	3	8·00	8	8	9·00	9	9
4 ,, .	57	2·00	2	2	7·00	7	7	8·00	8	8
5 ,, .	42	3·00	3	3	7·00	7	7	8·00	8	8
6 ,, ..	33	2·00	2	2	7·00	7	7	8·00	8	8
7 ,, ..	12	4·00	4	4	6·00	6	6	8·00	8	8
8 ,, ..	19	3·00	3	3	7·00	7	7	8·00	8	8
9 ,, ...	52	3·00	3	3	6·00	6	6	8·00	8	8
10 ,, ..	26	3·00	3	3	6·00	6	6	7·00	7	7
11 ,, ..	8	4·00	4	4	6·00	6	6	7·00	7	7
12 ,, .	4	3·00	3	3	6·00	6	6	7·00	7	7
14 ,, ..	20	3·00	3	3	5·00	5	5	6·00	6	6
15 ,, ..	79	3·00	3	3	5·00	5	5	7·00	7	7
16 ,, ..	46	3·00	3	3	6·00	6	6	8·00	8	8
17 ,, .	39	3·00	3	3	7·00	7	7	9·00	9	9
18 ,,	141	3·00	3	3	7·00	7	7	9·00	9	9
19 ,, .	36	5·00	5	5	8·00	8	8	10·50	11	10
20 ,, .	46	3·00	3	3	8·00	8	8	10·00	10	10
21 ,, ..	82	4·00	4	4	7·00	7	7	9·00	9	9
22 ,, .	38	3·00	3	3	7·00	7	7	9·00	9	9
23 ,, ..	33	3·00	3	3	7·00	7	7	8·00	8	8
24 ,, ...	2	3·00	3	3	7·00	7	7	8·00	8	8
25 ,, ...	84	3·00	3	3	7·00	7	7	8·00	8	8
26 ,, ...	5	3·00	3	3	7·00	7	7	9·00	9	9
27 ,, ...	9	3·00	3	3	7·00	7	7	9·00	9	9
	1,906	3·14	6	1	6·78	8	5	8·11	11	6

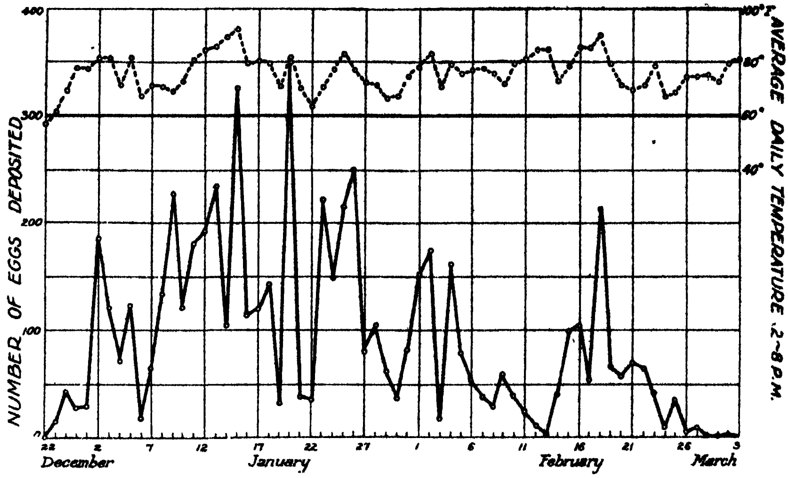


Fig. 7.—Time of Deposition of Eggs of Second Brood.

Larvæ of the Second Brood.

Time of hatching.—Larvæ commenced hatching on 6th January and continued until 8th March, with a maximum on 15th January. Fig. 8 (below) illustrates the hatching of second brood larvæ.

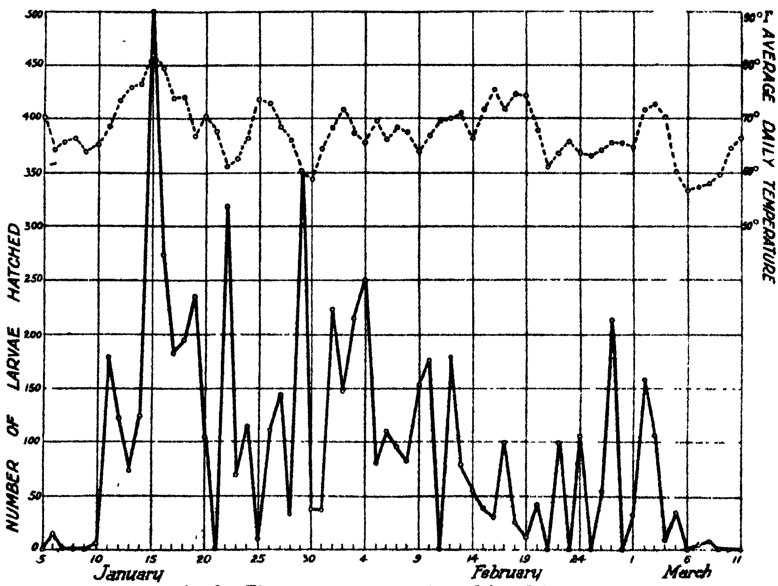


Fig. 8.—Time of Hatching of Second-brood Larvæ.

Length of feeding period.—The average feeding period of 105 non-transforming individuals was 28·23 days (see Table 12). The average feeding period of six transforming individuals was 22·83 days, with a maximum of 27 days and a minimum of 19 days.

TABLE 12.—Length of feeding period of non-transforming larvæ of the second brood at Bathurst.

Date of entering fruit.	Number of larvæ.	Feeding period in days. Average.	Maximum	Minimum	Date of entering fruit.	Number of larvæ.	Feeding period in days. Average.	Maximum.	Minimum.	Date of entering fruit.	Number of larvæ.	Feeding period in days. Average.	Maximum.	Minimum
11 Jan ...	4	23·75	27	21	30 Jan. ...	1	32·00	32	32	10 Feb. ..	4	31·75	38	27
15 ,, ...	2	25·00	29	21	31 ,, ..	3	29·33	31	28	12 ,, ..	3	30·33	33	28
17 ,, ..	4	27·25	32	20	1 Feb. ...	8	27·63	41	22	13 ,, ..	8	31·50	44	26
19 ,, ...	6	28·00	34	25	2 ,, ..	6	28·17	33	24	15 ,, ..	1	27·00	27	27
20 ,, ...	7	29·86	34	29	3 ,, ...	2	26·00	27	25	16 ,, ...	1	27·00	27	27
22 ,, .	4	27·75	29	26	4 ,, ...	10	29·40	35	23	17 ,, ..	1	30·00	30	30
24 ,, ..	5	26·40	29	24	5 ,, ..	1	33·00	33	33	20 ,, ...	2	29·00	31	27
26 ,, ...	2	25·50	29	22	6 ,, ..	4	27·00	29	25	22 ,, ..	4	27·00	29	25
28 ,, ..	7	26·29	27	25	9 ,, ...	4	27·00	30	24	27 ,, ..	1	30·00	30	30

Total number of larvæ ...	105
Average length of feeding period in days ...	28·23
Maximum length of feeding period in days ...	44
Minimum length of feeding period in days ...	20

Life Cycle of the Second Generation.

Only six transforming larvæ of the second brood were reared, the remainder being overwintering or non-transforming larvæ. The average life cycle of the transforming individuals was 51·50 days, and the complete life cycle would be 54·75 days, including the pre-oviposition period of 3·25 days. This information, together with the periods for the various stages is presented in Table 13.

TABLE 13.—Life cycle of the second generation at Bathurst.

Date of egg deposition	Number of individuals.	Incubation of eggs.	Larval-feeding period. Average	Maximum	Minimum	Cocooning period. Average	Maximum	Minimum.	Pupal period Average.	Maximum	Minimum.	Life Cycle * Average	Maximum	Minimum.
		days	days.	days.	days.	days.	days	days.	days.	days	days.	days.	days	days
30 Dec	3	7	20·00	21	19	5·00	6	4	13·33	14	13	45·33	47	44
13 Jan.	1	7	27·00	27	27	5·00	5	5	18·00	18	18	57·00	57	57
17 ,,	1	9	27·00	27	27	6·00	6	6	15·00	15	15	57·00	57	57
23 ,,	1	9	23·00	23	23	9·00	9	9	18·00	18	18	59·00	59	59
	6	†7·67	22·83	27	19	5·83	9	4	15·17	18	13	51·50	59	44

* Add 3·25 days for complete life cycle. † Average

THE THIRD GENERATION.

Insufficient second brood moths were reared to obtain complete data, as for the other generations. The third generation is incomplete at Bathurst, as approximately 95 per cent. of the second brood larvæ over-winter.

Summary.

Spring brood moths commenced to emerge on 19th October and continued until 9th January.

First brood moths commenced to emerge on 18th December and continued until 19th February.

A considerable overlapping of broods occurs.

A limited number of second brood moths emerge during the same season and give rise to a partial third brood of larvæ, all of which would over-winter.

The average number of eggs deposited in breeding jars varied from 22·07 for spring brood moths to 25·52 for first brood moths.

The highest average per female in any jar was 78·6, five first brood moths depositing 393 eggs.

The average feeding period for first brood larvæ was 29·14 days, and for the second brood larvæ 28·23 days.

The average cocooning period for first brood larvæ was 7·22 days.

The average pupal period for spring brood pupæ was 24·92 days, and for first brood pupæ 15·00 days.

The average incubation period of eggs of the first brood was 10·03 days, and of the second brood eggs 8·11 days.

The life cycle of the first brood averaged 62·69 days, and the complete life cycle, including the pre-oviposition period, 66·91 days.

The average interval before oviposition of the spring brood moths was 4·22 days, and of the first brood moths 3·25 days

The longevity of male moths of the spring brood was 18·32 days, and females 19·18 days. Male moths of the first brood averaged 16·72 days and females 16·86 days.

Silage as an Insurance.

UNDER the triple heading—"More about Ensilage—A Great Insurance Policy—Costs 3s. 6d. per ton, now worth £5"—the *Quirindi Advocate* published a letter dated 19th July, 1927, from Mr. Tom Scott, of Scott Brothers "Aberfeldie," Currabubula, from which we extract the following:—

"As you know, we had a wonderful winter last year, and all sorts of rubbish grew in abundance. We had an old cultivation paddock, which grew a wonderful crop of wild oats, being in places 6 feet high. This we decided to put into pits as the only way of getting rid of them. It seemed a big undertaking to handle 400 tons of green stuff, but it turned out much easier than we expected. The first thing we did was to get in touch with Mr. M. H. Reynolds, who came along and gave all the necessary information on ensilage making, and watched it right through. The cost was an eye-opener to me. I expected it to be big, but on working it out I was surprised to find that 3s. 6d. per ton covered it—digging the pits included. To-day its value is about £5 per ton. We have been feeding sheep, cattle, and horses on it for about six weeks, and they seem to be doing all right. The cows are milking well, lambing ewes are in good order, and the lambs are good."

Early Cucumbers.

J. DOUGLASS, H.D.A., Agricultural Instructor.

THE cucumber, although not recognised as a main crop in any portion of New South Wales, is in certain districts looked upon as a very important sideline. Farmers in the earliest districts of the State depend upon this crop as a reliable source of income.

No vegetable is so subject to price fluctuation, or in midsummer is so over-supplied to the market as cucumbers. All growers aim to place their produce on the early market during November and December, and it is only in districts such as the far North Coast and favoured localities on the Central Coast between Sydney and Newcastle that the climate and soil conditions are suitable for the early development of the crop.

The Sydney market is supplied during the winter and early spring by Queensland, and later by North Coast growers. The cost of placing cucumbers from these districts on the Sydney market is very high, but as good prices are always obtained during the early months a handsome profit is made by the growers. It is reported that last year a few consignments were received from California in good condition. Although this product is consigned long distances, it usually reaches market in fairly good condition, due largely to the mild weather experienced at that particular time of the year. The Queensland and North Coast cucumbers bring a good price early in the season, but with advent of warm weather the prices weaken until the demand almost ceases when the "locals" begin to come forward.

The cultivation of this crop during the summer is rather a simple matter, as the plants under good conditions are very vigorous growers and heavy yielders. The cultivation of a very early crop, however, is a very difficult matter, and requires a deal of experience to obtain good results. Physically the soil must be of an open nature, warm, ærated, and well drained, and to afford these conditions it must necessarily be sandy or a very light loam. Heavy soils or badly drained soils take too long to warm up during the spring, and are totally unsuitable. It will be found that in the very early districts of the State the soil is very light in texture. On the far North Coast the soil is red volcanic loam, while around the local early districts the soil is very fine sand or a light sandy loam. It has been found from practice that virgin soil, being rich in organic matter, is the most suited to the early cucumber.

Early ploughing of the land is essential to enable any organic matter to decay, and allow the weather and other factors to sweeten and ærate the soil. Due consideration must also be given at ploughing time to drainage, as soil erosion readily occurs in these soils. The "early" land is usually elevated, and unless numerous drains are made as soon as the land is broken up soil erosion will occur with the first rain. The rainfall in these districts is the heaviest in the State.

Seeding time takes place on the far North Coast during April, May, and June, but on the lower coast extra early planting is not practised owing to the difficulty of obtaining a good germination. Cucumber seedings are very easily drowned with excessive rain, and make very poor growth with cold weather. As the winter rain makes the soil cold and lifeless, sowing in the Erina Shire is not generally commenced until July. Hills are worked up and fertiliser worked into the soil with a fork hoe at planting time. The hills are spaced 6 feet by 4 feet apart, and at least a dozen seeds are planted in each one so as to allow for defective germination. With warm, dry weather during July, a good germination is obtained, but if heavy rain with cold weather occurs, a bad and very slow germination is usually experienced. Some growers make a practice of transplanting seedings from one hill to another where the seeds have failed to germinate. This is fairly successful

Early Cucumbers at Tumbi Umbi.
A crop of beans in the foreground.

under the very best of conditions, but under average circumstances the practice is hardly worth while. If a good germination is obtained, the plants are allowed to grow about 3 inches high before the weaker ones are thinned out, leaving only three or four in each hill. The after-cultivation is carried out with a forked hoe, and consists of destroying all weeds and keeping the soil in good open condition to encourage æration and increase the soil temperature.

The local crop begins to come on to the market during late October. The cucumbers are cut from the vines with a knife, graded, and packed in half-bushel "grape" cases.

A Fertiliser Trial.

High returns are very commonly obtained by these growers. Mr. George Lea, of Tumbi Umbi, obtained a net return of over £100 from 2 square chains of cucumbers in the spring of 1925.

This grower co-operated with the Department of Agriculture in conducting a manurial trial on the early crop. The object of the trial was to ascertain which fertiliser or mixture of fertilisers would give the best results with the cucumber crop. The land had only been cleared the previous winter, and was broken up with the plough in 1926. As this land is well elevated, all the subsequent operations were performed by hand. Planting took place on 29th June, the variety used being Commercial. During the early stages of the growth the conditions were ideal, warm weather prevailing with only a moderate rainfall. However, as the season advanced the shortage of rain was severely felt, and at the time when the fruit was developing dry conditions prevailed, with the result that the plants felt the severe strain. This resulted in a light crop and (with the continuation of the dry weather) the early destruction of the plants.

The results were as follows:—

P3, 717 lb. per acre	147 half cases per acre.
M3, 586 lb. "	140 " "
P7, 403 lb. "	131 " "
Basic superphosphate 512 lb. per acre ...	128 " "
Superphosphate, 448 lb. per acre	124 " "

As it is an accepted fact that manuring is necessary for the successful development of the cucumber crop, no unmanured plots were included in the trial. P 3 is a complete fertiliser containing phosphoric acid, nitrogen, and potash (and consisting of ten parts superphosphate, three parts sulphate of ammonia, and three parts sulphate of potash), and gave the highest yield. M 3, containing phosphoric acid and nitrogen (ten parts superphosphate and three parts sulphate of ammonia), showed a payable increase over superphosphate only. P 7 manure consists of equal parts of superphosphate and bonedust. Although not conclusive, this experiment showed that the cucumber crop is a very heavy feeder, and that heavy applications of a complete manure are payable when high prices rule for the product.

Varieties.

There are many varieties of cucumbers in existence, but the number grown in Australia is limited. The common long green type is the one in general cultivation, the most extensively grown varieties of which are Commercial, White Spine, and Long Green Prickly. Commercial is the variety most commonly grown by commercial growers, and it is reported to retain its dark-green colour longer than other varieties. A cucumber that changes its colour rapidly to yellow when fully grown is undesirable.

A variety recently imported from the United States of America under the name of Early Fortuna is showing great promise, but at the present time no definite recommendation can be given. The Apple-Shape variety, a very excellent type for the home garden, has been grown in this State for some time. Though a prolific cropper, it is only recently that commercial growers have taken it up, and the demand is already very keen. Its chief disadvantage lies in the fact that the colour is light straw, which deepens to yellow rapidly when maturing.

The Control of Fruit Fly.

Experiments with the Poison Foliage Bait.

T. McCARTHY, Senior Assistant Entomologist.

To Mally, of South Africa, and Berlese, of Italy, belong the credit of having first demonstrated the possibility of controlling fruit flies by the use of foliage poison spray. Since then the method has been experimented with in many countries, with varying degrees of success, depending upon the conditions prevailing in the country concerned.

In 1921 the writer first employed this method in New South Wales against the fruit fly in oranges, but the experiments proved no guide to the value of the method as a control, owing to the very limited infestation occurring.

In 1925 experiments with the poison foliage bait were again carried out on orange trees. Three areas of Late Valencia oranges in the Gosford district were used for the experiment, but it was again found that citrus trees were unsatisfactory for experimental work, owing to the very limited extent to which the fruit were infested. It is, therefore, not proposed to discuss the citrus experiments, but it may be of interest to record the infestation in the fruit examined during the course of the experiments as an indication of the limited extent to which oranges are infested.

The number of oranges from the control trees examined in four experiments totalled 4,039, of which only four were infested, notwithstanding the fact that the fruit on the trees retained for examination was allowed to hang until the second week in January to give it every chance of becoming infested. That this absence of infestation in the oranges was not due to an unusual scarcity of the fly was shown by the severity of the infestation in late peaches during the same season.

On account of their greater susceptibility to fruit-fly attack, late stone fruits are more satisfactory in the County of Cumberland for experimental work intended to indicate the efficiency of the poison foliage bait.

Some difficulty was experienced in obtaining suitable trees for experiment, mainly because the late varieties of stone fruits are not generally grown on the coast, where both *Chaetodacus tryoni* (Queensland fruit fly) and *Ceratitis capitata* (Mediterranean fruit fly) mostly occur. A number of late peaches were finally located at Richmond, about 38 miles from Sydney, and at Lower Portland, on the Hawkesbury River, and these were considered suitable for the experiments. McDevitt's Cling and Red Italian Slip were the varieties used in the experiments discussed here.

The Formula Used.

The formula consisted of 5 oz. of lead arsenate (powder), 4 lb. molasses, 3 gallons of water, and 1 gallon of fruit syrup. The amount of lead arsenate used is an increase over that used by many workers, and is based upon

laboratory tests carried out by the writer on the poisoning of fruit flies. These showed that when 3 oz. of lead arsenate were used it took from sixty-two to ninety hours to kill the majority of the flies when they were compelled to feed continuously upon the poison-solution. Under field conditions, where the spray is only applied every seven days, and the flies do not necessarily feed continuously upon it, it seemed reasonable to conclude that the flies would be killed even more slowly. The amount of lead arsenate was, therefore, increased to 5 oz.

The fruit syrup was prepared by slicing and boiling 4 lb. of inferior peaches in 1 gallon of water until they became pulpy. The liquid was then strained off, and the water lost by evaporation during boiling was replaced. The syrup was preserved with salicylic acid, 8 grammes (two-sevenths of an ounce) to the gallon, and the syrup was used as required.

Method and Quantity of Application.

The bait was applied to the tree on two or three patches only. No appreciable difference in control occurred when the trees were encircled with the bait. The fruit was avoided as far as possible, and this proved a very necessary precaution, as the bait sticks to the surface and shows on it. The fruit on trees with dense foliage was very easily avoided, but on trees with only a light crop of leaves some spotting occurred, though the loss of fruit from this cause was not sufficient to reduce the value of the method. The spray was applied with an automatic knapsack pump with "cut-off" nozzle. The pump proved very suitable for the work, but its chief disadvantage for use on a large area would be the necessity to refill it often, because of its limited capacity. Any pump ordinarily used in orchard practice should prove satisfactory. An automatic "cut-off" nozzle is essential to avoid the bait being wasted in passing from tree to tree. The application of the bait is facilitated by the operator passing up and down the rows, applying the bait to the trees in patches first on one side and then on the other.

The amount of bait that should be applied to each tree varies as it becomes largely a matter of judgment, but in practice it was found to work out between 6 and 8 fluid oz. per tree.

The following table shows the results of both experiments:—

		Number of Trees retained for examination.	Total number of Fruit examined.	Number infested.	Percentage infested.
Richmond—					
Treated trees ...	*a*	4	783	32	4·48
	b	4	705	24	3·4
	c	4	1,320	1	·07
Control trees ...	*d*	5	1,164	316	27·15
	e	1	320	121	37·81
	f	1	515	18	3·49
Lower Portland—					
Treated trees		5	3,315	742	22·38
Control trees		6	2,485	2,075	83·50

The Experimental Areas.

Richmond.—The orchard on which the work was carried out in this district comprised two blocks of trees separated by a grass paddock about 400 yards wide. The larger of the two blocks in which the trees were baited included about 500 early, mid-season, and late varieties of peaches, 136 citrus trees, and sixty mixed varieties of fruit trees. The smaller block consisted chiefly of early, mid-season, and late peaches. Both blocks were well cultivated, and the destruction of all fallen and infested fruit was carefully carried out by the grower. The varieties chosen for the experiment were the latest obtainable in the orchard, viz., McDevitt's Cling and Globe

The treated trees consisted of (*a*) thirty-five trees of McDevitt's Cling peaches; (*b*) fifty-two trees of the same variety separated by one row of plums and five rows of citrus trees; and (*c*) fifty-one Globes, separated from the McDevitt's Cling by five rows of peaches and adjoined on the other side by many rows of earlier varieties of peaches, the majority of the fruit from which had been marketed prior to the commencement of the experiment. The control trees consisted of (*d*) twenty-nine trees of McDevitt's at the end of the main block of trees, twenty-two rows from the nearest treated trees; (*e*) forty-five trees of the same variety in the block isolated from that in which the trees were sprayed; and (*f*) forty-seven Globes also in the latter block. The fruit on twelve trees in the whole of the sprayed trees and on seven trees in the control trees was retained for examination.

Five applications of the bait were given in the case of the McDevitt's (one application being a re-spray, owing to the previous spray having been washed off by rain), and four in the case of the Globes. The first application was given on 19th January to both varieties. The last application was given on 3rd February in the case of the Globes, and on 11th February in the case of the McDevitt's Cling.

The Globes were picked on 8th February, and the McDevitt's Cling on 16th February, 1926.

Lower Portland.—The work in this district was carried out on an orchard of mixed citrus and stone fruits contiguous to the Hawkesbury River. The plot of treated trees consisted of fifty-six Red Italian Slips bearing a good crop of fair quality fruit, although the trees had received no cultivation for some time and weeds and grass were abundant. The block also contained a number of earlier varieties growing under the same conditions. A number of fly-infested fruit were found beneath these, and it was apparent that the work of picking up the fallen and infested fruit had been largely neglected. The fruit on five of the treated trees was retained for a detailed examination. The control trees, the fruit from which was retained for examination, consisted of six trees of the same variety growing under similar conditions some 800 yards from the treated trees.

The first application of the bait was given on 13th January, and the last on 7th February, just prior to picking, five applications in all being given. The fruit on the trees retained was picked on 8th and 9th February, 1927. The fruit on the trees in the experimental blocks was marketed in the normal way by the growers, but the fruit on the trees retained for detailed examination was allowed to ripen, and consequently it remained on the trees as long as a fortnight after the other fruit had been marketed.

Some Comments.

In discussing the above results (*a*) and (*b*) and (*d*) and (*e*) in the Richmond experiment may be taken together, as the variety and the conditions under which the experiments were carried out were identical. It will been seen, therefore, that the average of the infestation in the treated trees is 3·74 per cent., and in the controls 32·48 per cent. This represents a difference of 28·74 per cent. in favour of the treated trees, and a reduction of fly infestation of 88·48 per cent. The figures indicate that the poison foliage bait very definitely controlled the infestation.

The percentages of infestation in both the treated and control trees with the Globe peaches—(*c*) and (*f*)—are too small to draw any definite conclusion, but here also the difference between the control and treated trees, viz., 8·42 per cent., is relatively great, and represents a reduction of fly infestation of 97·99 per cent.

In the Lower Portland results the actual difference in fruit-fly infestation is 61·12 per cent. in favour of the treated trees, representing a reduction in fly infestation of 73·21 per cent. Although the amount of infestation in the treated trees, viz., 22·38 per cent. may be considered altogether too high, the experiment clearly shows the value of the foliage poison bait, in view of the severe infestation occurring in the controls.

At Richmond the experiments were carried out under more favourable conditions than at Lower Portland, because of better cultural methods and care in picking up the "drops." The conditions, therefore, imposed a less drastic test than at Lower Portland, where the conditions generally favoured the presence of the flies in much greater numbers and enabled more flies to penetrate the spray barrier. In both experiments numbers of trees were left unsprayed, and other experiments (not referred to in this paper) have shown that the presence of unsprayed trees has some influence on the result, apparently because some flies feed normally and then migrate to the treated trees and lay their eggs without attempting to feed upon the foliage bait. It seems reasonable to conclude that if the other varieties in the orchards had been progressively sprayed according to their order of ripening, the results would have been even more satisfactory. In both experiments the infestation of the fruit mainly occurred when the fruit was nearly ripe.

Flies bred from infested fruit showed that the Mediterranean fruit fly (*Ceratitis capitata*) was alone responsible at Richmond, and that the Queensland fruit fly (*Chaetodeacus tryoni*) predominated at Lower Portland in the proportion of two to one.

Cost per Acre.

In practice it was found that from 6 to 8 fluid oz. of spray was required per tree, and that the time occupied in spraying an acre of trees would not be more than one hour. Assuming that 8 oz. of spray is used per tree, an acre would require approximately 5 gallons of spray, consisting of 6¼ oz. of lead arsenate and 5 lb. of molasses. The cost per acre for one application would, therefore, be as follows:—

	s.	d.
6¼ oz. of lead arsenate at 1s. 6d. per lb.	0	7
5 lb. molasses	0	8
Labour	1	3
Cost for one application	2	6

As not more than five applications are necessary, the total cost would be approximately 12s. 6d. per acre or 1½d. per tree.

Summary and Conclusions.

The foliage poison bait, consisting of 5 oz. of lead arsenate, 4 lb. molasses, 1 gallon fruit syrup, and 3 gallons water, applied every seven days, will protect trees from both *Ceratitis capitata* (Mediterranean fruit fly) and *Chaetodacus tryoni* (Queensland fruit fly).

Not more than five applications are necessary, the first being given five weeks before the fruit is harvested, and others at intervals of seven days. The bait is applied to the tree in patches; the whole tree is not sprayed. The fruit should be avoided as far as possible, as the bait adheres to the surface, giving the fruit a spotted appearance.

The best results can be obtained in stone fruit orchards by progressively spraying the orchard in accordance with the order in which the fruit ripen or are harvested.

Where good cultivation and the destruction of fallen fruit is carefully carried out, thus reducing the incidence of the flies, the best results with the poison bait are obtained.

The fruit flies prefer to lay their eggs in the ripening fruit.

Late peaches, when allowed to ripen on the trees, may become seriously infested by both species of fruit flies. The practice of the grower, therefore, of marketing the fruit before it is ripe considerably reduces loss due to fruit fly.

The actual loss in citrus fruit owing to fruit-fly infestation is very slight —counts indicating 0·9 per cent. It is suggested, however, that the poison foliage bait be applied to citrus trees for five weeks prior to the colouring of the fruit. This will kill those flies which have bred in the late stone fruits and have turned their attention to citrus fruits during April and May.

These flies are responsible for the slight infestation found in oranges and mandarins, and cause the withholding or cancellation of fly-free certificates.

A Home-made Device for Holding Fruit Wrappers.

G. B. BARNETT, Assistant Orchardist, Glen Innes Experiment Farm.

A VERY useful device for holding fruit wrappers can be made with very little labour and at practically no cost for materials.

Take an 8-inch length of 10-gauge galvanised wire and bend it as shown in Fig. 1; sharpen the shorter side (A) to a point, and solder a ¾-inch metal washer to the other end (B in Fig. 1). Next make a light wire spring 3½ inches in length and not more then ¾ inch in diameter, by winding a light steel wire round a lead pencil or large nail, and place this spring over the side of the wire that has the washer attached (see B in Fig. 1).

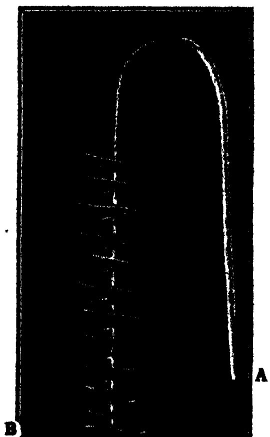


Fig. 1.

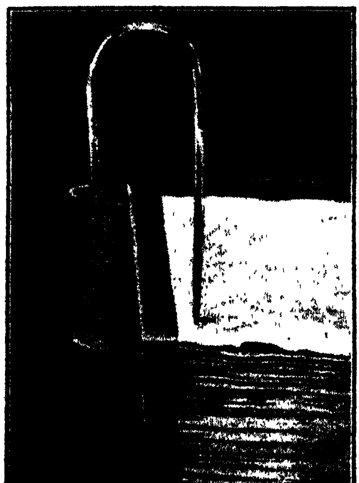


Fig. 2.

With a piece of a kerosene tin, make a tube 3½ inches long with a diameter just slightly greater than the ¾-inch washer, soldering the tube on the outside and making sure that the inside of the tube is free from solder. Over the end of this tube solder a round piece of tin slightly greater in diameter than the tube; place the end of the wire with the washer and spring into the tube and solder another round piece of tin over the top of the tube. Care should be taken to see that the spring is neither too strong nor too weak before the top is soldered on.

Next cut a piece of tin 4 inches by 2 inches, solder it to the end pieces of the cylinder by bending straight edges on one side. Nail through this piece of tin to fasten the holder to the side of the wrapping-paper stand (see Fig. 2). A little oil applied to the sides of the container will help to make the spring work more easily.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Field Peas—	
French Grey	Principal, H.A. College, Richmond.
Lima	Principal, H.A. College, Richmond.
Potatoes—	
Satisfaction	Hillen and Leckie, "Cherragorang," Taralga.
	J. J. Maloney, jun., Stonequarry-road, Taralga.
Early Manistee	J. Cusack, Stonequarry-road, Taralga.
Factor	W Reddacliff, Milgarra, Tenterfield.
Carman No. 1	Johns Bros., "Strathalbyn," Myrtleville.
Batlow Redsnooth	T. A. Howard, Cottawalla, Crookwell.
	E. M. Herring "Sheen," Batlow.
Maize—	
Early Morn	J. S. Whan, Llangothlin.
Fitzroy...	F. W. Hill, Yarramalong,
Leaming	Manager, Experiment Farm, Grafton.
Wellingrove	Manager, Experiment Farm, Glen Innes.
Broom Millet	W. T. McDonald, Taree Estate, Taree.
Grasses—	
Sudan Grass	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Yanco.
	C. Bennett, Forbes-road, Cowra.
Sweet Sorghums—	
Collier	Manager, Experiment Farm, Grafton.
Selection No. 61	Manager, Experiment Farm, Grafton.
Saccaline	Manager, Experiment Farm, Wollongbar.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Californian Methods of Handling and Marketing Fruit.

J. D. BRYDEN, Assistant Orchardist, Yanco Experiment Farm.

THE co-operative methods adopted in California for the handling and marketing of the fruit, and natural conditions that are ideal for the production of good crops, have been the main factors in placing the fruit-growing industry of that State on a very high standard.

Favoured with climatic and soil conditions unsurpassed for the production of practically all classes of fruit and having abundant supplies of water from natural sources in all parts of the State, the growers are able, by good cultural methods, to produce quality as well as quantity in their fruits. However, no crop is profitable, no matter how great the yields or how choice the quality, unless a suitable market can be obtained, and in this respect the Californian fruit growers are fortunate in having large local and export markets close at hand. Although they have much in their favour, their handling, and methods of marketing play a big part in the success, and credit must be given to them for the way in which they have built up an industry that is so prosperous and on such a sound basis.

The fruit grown in California is in no way superior to that grown in Australia, and the cultural methods are very similar to those adopted in our fruit-growing centres, but the handling and marketing of the fruit is carried out on much more advanced lines. It is not intended in this article to draw comparisons between the two countries, but to describe briefly the organised methods adopted in California.

It is a well known fact that climate plays a large part in the quantity and quality of any crop—adverse weather conditions are quite often responsible for partial or absolute failure.

In California the seasons are definite and although there is a variation in the different parts of the State, weather conditions in each particular district can be absolutely depended upon, as they rarely change, being the same year after year.

Fruitgrowers have made full use of the advantage offered by nature, growing only those classes of fruit which have been found most suitable under the prevailing climatic and soil conditions of each particular district. In Santa Clara County, for instance, prunes and apricots are the main crops grown, because the soil is admirably suited to them, producing large crops of good quality, and the climate is ideal for the growing and drying of these crops. Similarly, Fresno, in the San Joaquin Valley, is the centre of the raisin industry in California.

This selection of suitable districts has done much to facilitate co-operation by reason of the fact that the growers of one class of fruit are more or less in groups. There is no doubt that the advanced methods of handling

and marketing fruits in California, are largely due to co-operation: growers in every branch of the industry have a co-operative organisation which deals exclusively with their product. Thus we find, among others, the citrus growers, prune and apricot growers, raisin growers, peach growers, walnut growers, and even strawberry growers, each with an organisation taking care of the members' particular interests. These associations market the fruit under standardised grades and packs with the trade name or brand of the association, and distribute through their representatives in the different centres of the United States and abroad.

The matter of handling—from the picking until the fruit is loaded in railroad cars, ready for shipment—is one that the Californian fruit-growers have studied very carefully and thoroughly, so that at the present time the different operations during handling, are at a very high point of efficiency. Careful handling of the fruit and elimination of all unnecessary handling is the constant aim of the Californian grower and packer.

The way in which fruit is picked, in Californian citrus groves, is a good example of careful handling. The fruit is picked on systematic lines, and 1 per cent. is allowed each picker for long stems, clipper cuts, &c. Each picker has a number which is put on each box, so that after inspection at the packing house the picker of any box can be readily traced, and informed if the faults exceed the 1 per cent. allowed. In this way a check is kept on each individual picker and injury resulting from picking faults is reduced to minimum.

Unnecessary handling is always an expensive item, and the fact that Californian growers and packers realise this is very evident when a study is made of the methods adopted. The packing houses are systematically laid out as regards plant, so that each operation follows closely on the previous one to eliminate loss of time as far as possible. Labour-saving devices are used, where possible, and in this way time and handling (both important factors in cost of production) are saved.

The "Sun Maid" raisin-growers' packing house, in Fresno—which is one of the largest fruit packing houses in California—where the writer spent some time, is probably the most up-to-date as regards machinery and systematic planning. Here the fruit after being received from the grower is roughly stemmed and cleaned. It is then conveyed, by means of elevators, to the fourth floor of the main packing building, and from there the fruit passes through the different operations of grading, cap-stemming, processing, packing, &c., until the finished article is conveyed into the railroad cars at the loading platform on the ground floor. From the time the fruit is received from the grower until it is loaded in the railroad car it is practically untouched by hand. As a result of modern and systematic planning, labour-saving devices such as gravity rollers and conveyor belts besides other machines, are used to save time and handling throughout the different processes of preparing the raisins for market.

The position of Californian growers is, of course, enviable as far as marketing conditions are concerned. The fact that the population of the United States is over 115 millions and that there are countries in close

proximity where large quantities of fruit are consumed, thus providing good markets, help considerably in the distribution of the fruit growers' products. However, the co-operative associations are probably the most outstanding factors in this matter. These organisations are in a position to carry out extensive advertising campaigns which are more effective by reason of the fact that the organisations represent group growers who by their combined efforts produce an article of the highest quality and uniformity in every respect.

Advertising is an important factor in the process of distribution, and Californian co-operative organisations are fully aware of the benefits to be obtained in this way. Through the medium of newspapers and periodical publications of all kinds, hoardings, pamphlets, and in numerous other ways the trade name or brand of their product is constantly before the public, thus creating an increased demand. By way of illustration of the methods adopted of advertising by some Californian packers, a process of branding oranges and walnuts is carried out. In some citrus packing houses the first-grade oranges are put through an automatic machine which stamps the trade name on each orange in a special printing ink which dries very quickly and will not rub off. The fruit is not injured in any way during the operation. Each orange falls into a cup on the machine and a rubber stamp passes over the fruit leaving a small and neat imprint. In the same way all walnuts which are handled by the Walnut Growers' Association are stamped with a diamond which is the brand of that Association.

Uniformity in grade and quality is essential if good markets are to be obtained and held. Californian packers pack under standardised grades as regards size, colour, and quality. The large quantities of fruit which, due to co-operation, are at the disposal of the packer, facilitate standardisation to a great extent, ensuring increased uniformity and better quality products.

Attractive packing is also a point to which packers in California have given a deal of consideration. If a case of fruit has an unattractive appearance it is certainly not going to bring as high a price as one which is neatly packed and made to look attractive. In California the fruit itself is made attractive by different means and processes. Wrappers are used for the packing of practically all fresh fruits—some slightly coloured according to the class of fruit, others white. Each wrapper has the trade name or brand printed on it in an attractive design giving the finished article a neat appearance. Labels are invariably used on boxes containing fresh and dried fruits, generally with the trade name or brand printed on in a design the same or similar to that on the fruit wrapper in the case of fresh fruit.

The associations have their own efficient sales service branch operating in the larger centres of the United States. Through their representatives the head office of the association is, at all times, well informed as to the

conditions of the market in each particular centre. In this way a more even distribution is obtained, resulting in a steady demand and consequently better returns for the fruit.

In conclusion, it may be said that Californian growers take into consideration the smallest details, and aim at efficiency in every operation of the growing, handling, and marketing of their fruit.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
Hygienic Dairy Company, Glenfield Farm, Casula, Liverpool	113	15 Sept., 1927
New England Girls' Grammar School, Armidale	11	15 Oct., 1927
Lunacy Department, Morisset Mental Hospital	16	18 ,, 1927
Department of Education, May Villa Homes	6	3 Nov., 1927
Department of Education, Eastwood Home	10	3 ,, 1927
Department of Education, Hurlstone Agricultural High School	47	4 ,, 1927
Lunacy Department, Rydalmere Mental Hospital	61	23 ,, 1927
A. E. Collins, Hazelhurst Dairy, Bowral	13	6 Dec., 1927
Miss Brennan, Arrankamp, Bowral	27	7 ,, 1927
Lunacy Department, Callan Park Mental Hospital	26	15 ,, 1927
Department of Education, Yanco Agricultural High School	26	12 Jan., 1928
A. V. Chaffey, "Lilydale," Glen Innes	15	25 ,, 1928
Lunacy Department, Kenmore Mental Hospital	99	1 Feb., 1928
Walaroi College, Orange	2	3 ,, 1928
Lunacy Department, Orange Mental Hospital	3	7 ,, 1928
Australian Missionary College, Cooranbong	51	11 ,, 1928
Department of Education, Gosford Farm Homes	18	18 May, 1928
William Thompson Masonic Schools, Baulkham Hills	34	31 ,, 1928
E. P. Perry, Nundorah, Parkville (Guernseys)	30	8 June, 1928
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	38	11 ,, 1928
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	70	16 ,, 1928
Department of Education, Mittagong Farm Homes	30	22 ,, 1928
Sacred Heart Convent, Bowral	11	23 ,, 1928
R. Burns, Wilga Glen Dairy, Coonamble	49	23 ,, 1928
Dominican Convent, Moss Vale	4	24 ,, 1928
Kyong School, Moss Vale	2	3 Aug., 1928

—MAX HENRY, Chief Veterinary Surgeon.

RATIONS FOR EWES IN LAMB.

AN excellent ration for ewes in lamb consists of 1½ lb. lucerne chaff with 2 oz. of some grain such as wheat, maize, or oats. Bran is not a very satisfactory feed for ruminants on account of its tendency to become sour and because of its cost, but if it is used a good ration consists of up to ½ lb. mixed with 1 to 1½ lb. of chaff. Aged and broken-mouthed ewes can be fed on nuts so long as their molars are in good condition, but best results will be obtained if some roughage is also available.—E. A. ELLIOTT, Sheep and Wool Expert.

The Protection of Trees From Wood Rot.

PREVENTIVE AND CURATIVE MEASURES.

G. B. BARNETT, Assistant Orchardist, Glen Innes Experiment Farm.

MANY of the diseases to which fruit trees (and shade trees) are subject, result in some form of wood rot or decay. The bark of a tree is a natural barrier, as long as it remains unbroken, to turn aside the fungi which would enter and destroy the heart of the tree, but this protecting covering is often broken, during pruning operations (as by the removal of a limb), by cultivating implements, or by boring insects, and eventually it is destroyed by parasitic fungi, and a hollow in the tree is the result.

There are two objects in protecting exposed surfaces, which is best done by the use of paint or tar; first to prevent the infection of the surface by

Fig. 1.—The Result of Neglect.
Preventive measures should have been adopted immediately this large limb was removed.

Fig. 2.—The Cavity cleaned out to Healthy Wood.
The decay has extended some distance underground.

fungous spores, and second, to prevent checking and cracking of the surface which would permit the entrance of water, thus aiding decay. A few moments work at the right time may save expense later on and prevent considerable damage to the tree. When, however, protective measures have not been taken, the treatment must be curative rather than preventive, if the profitable life of the tree is to be spared.

Figure 1 shows a tree which has been neglected. In a case like this, the first task is to remove all the diseased wood; a chisel and mallet are the handiest tools for the job. After the wood is removed down to white, healthy tissue (see Fig. 2), the whole surface should be disinfected with

Fig. 3.—Cavity filled with mixture of Sawdust and Hot Tar.

Fig. 4.—Present condition of Tree treated in 1925. Note how the cambium layer is growing over the filling.

some wood preservative such as mercuric cyanide. If the cavity is not filled immediately it is advisable to paint the exposed surface with shellac or grafting wax, which will prevent the wood from drying out. If the cavity is to be filled immediately, then paint the cavity with cool tar.

Experiments have shown that a filling of sawdust and tar has numerous advantages over a cement filling, particularly in that it is pliable after being placed in the cavity; in the case of large ornamental trees where large hollows are to be filled, it will be found that a composition of tar and sawdust bends with the tree. The tar has preservative and antiseptic qualities which tend to preserve the wood with which it comes in contact.

The sawdust is mixed with hot tar and packed tightly into the cavity (see Fig. 3). Where a long and wide cavity is to be filled, it will be of advantage to tack a piece of fine wire mesh netting over the face of the cavity to prevent the mixture from working out while being rammed in. When the cavity is completely filled, the surface should be given several coatings of tar, or a facing of cement (one of cement to six of clean sand). The surface of the filled cavity is left a little below the bark line, so that the cambium layer may roll (or grow) over, and eventually bury the treated surface with healthy tissue (see Fig. 4).

IMPORTS AND EXPORTS OF FRUIT.

THE following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 30th June, 1927.

Description.	Imports.	Exports.
Interstate.		
	Cases.	Cases.
Fresh Fruits ...	671,412	67,369
	bags.	bags.
" " ...	378	...
	cases.	cases.
" Tomatoes..	90,936	...
	lb.	lb.
Canned Fruits ..	40,236	2,128
Dried Fruits—		
Unspecified ...	21,336	12,040
Currants ...	12,488	560
Raisins ..	9,352	308
Apricots ...	1,260	...
Apples ...	4,592	56
Peaches ..	840	...
Pears	392	...
Prunes ...	3,080	112

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Citrus	....	3,233	5,492
Apples ..	....	40	1,203
Bananas ...	....	2,175	...
Pears	....	...	472
Pineapples ...	....	1	386
Other	....	329	6,397
Dried Fruits—		lb.	lb.
Apples, Pears, Peaches, etc.	U.S.A.	28,930	...
Apples ...	....	...	196
Apricots ...	....	...	168
Currants ..	....	...	355,558
Prunes ...	U.S.A.	172,024	702
Peaches ...	....	...	78
Raisins—			
Sultanas ...	....	...	124,540
Lexias ...	....	...	42,800
Other ...	....	..	23,944
Dates	Mesopotamia ...	96,368	10,981
	France	900	...
Other	....	...	1,515
	China	3,697	...
	France	13	...
	Smyrna... ...	2,329	...
	Spain	20	...
	Syria	2,553	...
	United Kingdom	210	..
	U.S.A. ...	6,061	...
Preserved in liquid—			
Apricots ...	....	...	31,439
Peaches ...	....	...	43,686
Pears ...	....	...	5,206
Pineapples ...	....	...	1,753
Raspberries	....	...	4,176
Other ...	....	...	22,689

Controlling Codling Moth in U.S.A.

UNDER the above title a recent issue of the *Pacific Rural Press* contains a report of a meeting of eighteen leading entomologists of the Pacific Coast, who for more than a day considered the worm in the apple and pear. We are apt to regard the United States, and particularly California, as ahead of New South Wales in all matters pertaining to fruit production, but this report shows that the "last word" in codling moth control in that country has yet to be heard, for definite recommendations are said to be "in the process of formation," and certain facts which "the committee desires to emphasise" have a striking similarity to the recommendations issued by the Department of Agriculture in this State.

As presenting the best knowledge and opinion in a great apple-growing country, the report is worth quoting:—

Arsenate of lead is the only known insecticide that is practical and effective in codling moth control.

Other insecticides must be considered either ineffective or still in the experimental stage.

Definite recommendations for the control of the codling moth are in the process of formation and will be available in the near future.

At the present time this committee desires to emphasise the following facts:—

The early spray applications are much more effective in codling moth control and much less objectionable from the standpoint of spray residue than the late applications, therefore more emphasis must be placed on the calyx and early cover sprays. The first brood must be practically eliminated in order to prevent heavy infestations by later broods.

Late sprays should be made only where infestations are of sufficient importance to warrant further attention. Special advice should be obtained from a competent authority before such applications are made.

In addition to the spray programme, the following control measures are necessary:—Banding of trees to trap larvæ; orchard sanitation, such as destruction of windfalls; scraping the bark of rough limbs; thinning of fruit for the purpose of removing infested fruit from the trees, and breaking of clusters so that spraying may be effectively done; proper pruning to facilitate spraying; packing-house and dry yard sanitation, such as proper construction and screening of packing sheds, treatment of apple boxes and sacks; destruction of cull fruit and waste products.

We recommend the full enforcement of all horticultural and quarantine laws which may in any way relate to codling moth control.

The present crisis demands that further uninterrupted research and experimental work be undertaken, and that adequate funds be immediately procured to prosecute same.

The practical recommendations contained in the above are thus:—

(1) Early applications of lead arsenate.

(2) Bandaging of trees.

(3) Orchard sanitation (by which is meant destruction of infested fruit at frequent intervals and removal of all harbour for grubs).

(4) Packing house sanitation (by which is meant prevention of escape of all moths that may emerge from shelter in the packing shed, dipping of cases, &c., and the destruction of all infested fruit at frequent intervals).

How closely these items resemble the advice offered to growers here does not need to be emphasised.

Research upon codling moth control is being carried out by this Department. An officer of the Entomological Branch was stationed at Bathurst Experiment Farm last season, and devoted his time exclusively to the study of the life history and methods of control of the codling moth, and reports on the work done have appeared in this and previous issues of the *Agricultural Gazette*. The work is being continued.

INFECTIOUS DISEASES REPORTED IN JULY.

THE following outbreaks of the more important infectious diseases were reported during the month of July, 1927 :—

Anthrax	Nil.
Pleuro-pneumonia contagiosa	1
Piroplasmosis (tick fever)	Nil.
Blackleg	3
Swine Fever	5

—MAX HENRY, Chief Veterinary Surgeon.

METHOD OF INCREASING MILK CONSUMPTION IN U.S.A.

ACCORDING to the Department of Agriculture, U.S.A., the "Milk-for-Health" campaign has increased the consumption of milk in the United States approximately 27 per cent. in the eight years for which results have been checked.

As the result of more than sixty separate drives in which the Department assisted in 1918-1925, an average reduction of 12 per cent. in under-nourishment among school children has been accomplished.

The report states that many cities and rural communities have found that there is a relatively high percentage of under-nourishment among children, and that this condition frequently accompanies a low average per capita consumption of milk. Experience has shown that this failure to use an abundant supply of milk cannot be attributed wholly to a lack of material wealth, but rather to a lack of information regarding the importance of milk in the normal development of the growing child.

In 1918 the United States Department of Agriculture formulated a plan for carrying on milk-for-health campaigns. A definite arrangement was made for co-operation with the extension service of the State agricultural colleges, and early in 1919 the first milk-for-health campaign was conducted in one of the New England States. This was followed by similar work in near-by States. Gradually the idea spread, and campaigns of this kind have been conducted in over thirty States.

The result of these combined efforts is a 27 per cent. increase in consumption of milk in the States since 1918, and an average of 12 per cent. reduction in under-nourishment among school children has been effected in those communities in which comparisons could be made, while the increase in milk consumption has ranged from 10 to 30 per cent.

Poultry Notes.

September.

JAMES HADLINGTON, Poultry Expert.

THE outlook in the poultry industry is very much brighter than at this time last year. The price of practically all poultry foodstuffs is lower, and the prices being received for eggs have been higher during August than has been the case in recent years. One effect of this is a large increase in the number of chickens being reared. All this goes to show how quickly the industry responds to improved conditions.

A good deal of the buoyancy in prices is due to the large increase in the number packed for export last year—not only in this State but in practically all the States. The 107,000 cases of eggs that left the Commonwealth last year for overseas had the effect of baring every market in Australia of eggs, with the result that fewer eggs were put into cold storage, and something of a shortage of eggs was experienced during the winter in every State except perhaps Queensland, which, of course, has a little advantage in winter egg production.

It is safe to say that whatever the loss made on export last season, it will have been fully recouped in other ways, and the farmer is much better off than he would have been had export been on a more restricted scale.

We have, from time to time, heard and read a good deal about the competition our eggs have to meet in London, but all the available evidence points to the fact that our eggs are in greater demand now than at any time since export has been a factor in the marketing of our eggs. The reason is not far to seek. Egg production in all competing countries is on an even lower scale during the winter months than is the case in Australia, and the great bulk of eggs which arrive in England from those sources during the winter months there have been held—some in cold storage and others without—for perhaps many months before coming on to the market. On the other hand, our eggs have only been held for at most about eight weeks. Moreover, our eggs have been packed fresh from farms which specialise in egg production, whereas many of the eggs competing with them are "farmer's eggs," gathered from far and wide. Eggs from Australia if packed right up to the best standard, should, therefore, be as good as the average English home-produced article.

That London buyers are at last awakening to the advantages of operating with Australian eggs is evidenced by the eagerness of exporters to start packing. If further evidence is needed it will be found in the offer of an advance of 1s. 4d. per dozen on eggs for export, which is now being made by one prominent shipper.

If such an advance is possible carrying with it, as it does, the prospect of participation in higher realisations, it is the best indication we have had yet of the room there is for expansion in the poultry industry here.

While seeing all this, however, let us not overlook the fact that our own local market is far and away the best. Unfortunately nothing is being done to increase local sales, and there is room for doubt whether the interests which are handling our eggs are not more keen on overseas trade than on local consumption. If this were not so it would be difficult to understand eggs being packed for export on an advance of 1s. per dozen while the local price is 1s. 9d., and while it is known that our own market on the whole is under-supplied. Then again, as to the advance, is it reasonable to suppose that such a low advance as 1s. per dozen will help our realisation in London? Will it not tend to make more difficult the path of other exporters in securing the highest price when making contracts for another year? The principle of advance is a sound one, but the application of it needs close scrutiny in order to safeguard producers' interests.

This brings us to the one great need of the poultry industry—a strong organisation with a few keen but level-headed people at the head of it, in order that the interests of the industry might be scrutinised from every angle. It is a matter for regret that such an organisation did not have birth at the recent conference. The Poultry Farmers' Association might have had to go into the melting pot, but if the result had been a wider, simpler, and more embracing organisation it would have been worth while.

However, another attempt is about to be made, and in the interests of all concerned it is to be hoped that success will attend the effort. Should this eventuate poultry farmers should ensure that safeguards are provided that will preserve their freedom of action in respect of the marketing of their produce, and that they are not committed to responsibilities which might limit that freedom either at present or in the future.

One of the great weaknesses in all attempts at organisation of the industry so far has, in my opinion, been the regular monthly meetings. At many of these there is little or nothing of importance to be discussed; the consequence is that attendance falls off, and with it interest in the Association declines. A much better plan would be to make a number of fairly large districts, and to have a secretary and president in each, whose business it would be to keep in touch with a central executive and to summon meetings of poultry farmers whenever it is necessary to discuss specific subjects in the interests of the industry.

Further Hints on Brooding.

Last month's notes were largely devoted to brooders and brooding, but the subject is of such importance at this time of the year that we can afford to enlarge upon it. September is the month that is perhaps productive of more brooding troubles than any other. At first sight this might seem strange, but when the matter is explained it will be better understood. There

are two main factors to account for brooder troubles in this month. Firstly, there are, of course, more chickens being reared, and as most farms are more or less pinched for brooder space and rearing accommodation generally there is a tendency to close up closer, and still closer, in order to keep pace with the output from the incubator, which has now reached its maximum for the season. The result is very often crowding to the danger limit. This, added to the fact that September weather conditions are usually somewhat tricky or erratic, constitutes this particular month one of the most risky in the rearing season. Hot in the day time with many cold nights, and some wholly or partially cold days, are conditions that entail extra concentration and alertness on the part of the operator if he is to avoid the chickens getting a chill. A fall in temperature of 10 to 20, and even 30 degrees Fahr., inside of a few hours is not unusual at this time of the year. It is in these warm September days with an occasional mild night that the average poultry farmer begins to congratulate himself that as the weather is getting warmer his chickens will require less attention and even lower temperatures to keep them right. This complacency more than any other circumstance leads to brooding troubles.

It is not an uncommon thing to find that during July and August, when there is difficulty in maintaining sufficiently high temperatures, the brooders are covered with sacks and such materials. But just as soon as the warm September days are felt all these aids to temperatures in the brooders are discarded, the operator considering that there is no more necessity for them. Then suddenly a cold snap occurs, and the temperatures fall too low and crowding together takes place in the efforts of the chickens to get warm. One night (even a few hours) of this sort of thing is quite sufficient to start trouble. The following day may again be warm, and the operator goes on, unaware of what has taken place during the night. A day or two later the chickens are seen to be looking a bit ruffled in plumage and not quite so keen for their food. The trouble is beginning to show itself. The cold snap has by this time been forgotten, and the operator starts speculating as to the particular disease his chickens are suffering from. Hundreds of thousands of chickens are lost every year under the conditions described, disease being blamed, whereas a fall in temperature was the simple and preventable cause.

Such happenings are not confined to one class of brooder; they are common to all, from cold brooding to hot-water circulating systems. With the cold brooder, for instance, the tendency is to lift the cover too high off the backs of the chickens while the weather is warm, and to fail to lower it during a change to lower temperatures. With hot water circulation the heater is let down, the hovers are lifted, or the box lids left too high, as the case may be, all on the assumption that the weather is now getting warmer.

The worst of all is where iron hovers are in use. During the cold weather these are mostly covered up with sacks, which are often pulled down very near to the floor of the brooder and the chickens generally made cosy. Later

on, this material is removed, and the operator, not realising to the full how rapidly the iron conducts heat, fails to take the same precautions as he would have done earlier in the season. The result is that on a cold night there is practically no warmth under the hovers. Herein lies the necessity for the use of thermometers in the brooder compartments. It is a big mistake for chicken rearers to attempt to brood chickens without thermometers.

Avoid Getting Up at Night.

A large number of poultry farmers using coke burning heaters complain that they must get up, or at any rate do so, during the night to stoke up the heater. It might be pointed out in connection with hot water circulating plants that where getting up in the night is necessary there is something wrong, either with the installation itself or with the working of it. As proof of this it is worth emphasising that there are five brooder houses heated by hot water circulating systems at the Government Poultry Farm, Seven Hills, and three at Hawkesbury Agricultural College, Richmond, yet it is not found necessary to attend to the heaters during the night. They are stoked with coke between 9 and 10 p.m., the temperatures are looked to, and no further anxiety is felt about them, nor does any one even look at them until next morning about 6 a.m.

Any farmer experiencing trouble of this nature should make time to visit these poultry sections, or should write to the Department, stating his troubles. It is known that there are quite a large number of hot water circulating plants that are faultily constructed—hence the troubles. Plans and instructions are available to poultry farmers from the Department on application.

Improvement of Dairy Cattle in Irish Free State.

According to the Department of Agriculture there has been a most gratifying expansion of the measures for the improvement of dairy cattle in the Irish Free State. The number of Cow Testing Associations has been increased from 154 to 208, and the number of cows under test from 26,000 to nearly 54,000. It is estimated that approximately 230 associations will be recognised for the year 1927, representing an increase of over 42 per cent., as compared with 1923. Coincident with this progress in the grading up of non-pedigree dairy cattle there has been a correspondingly satisfactory increase in the number of pedigree dairy cows brought under test and in the number of new pedigree herds established. The latter developments have been largely assisted by the provision by the Department of an increased number of high-class stock bulls at approximately half cost for the use of Cow Testing Associations, and by the leasing of such animals at a nominal fee to owners of small pedigree herds, who would not otherwise be in a position to purchase suitable animals for service purposes.—*News Bulletin.*

Orchard Notes.

September.

W. J. ALLEN and W. LE GAY BRERETON.

The season is approaching when the demand made by trees upon the soil for moisture is heavy and the evaporation great. Hence everything practicable must be done to check loss, whether it be by direct evaporation from the soil or through weeds. Owing to the lack of winter rains there has been very little opportunity in many of our fruit districts of storing up moisture in the soil, and where water for irrigation is not available useful falls of rain during the season will be necessary if the crops are to mature properly.

Under these conditions it is more essential than when soaking rains have fallen during the winter that all weed growth should be destroyed early. The major portion of this work was, of course, done by the winter ploughing. This should have been completed not later than the end of July, and its delay until August or even till September is far too risky under ordinary conditions, though where autumn ploughing has been carried out such delay may be justified by the condition of the soil.

Besides the destruction of weeds at the present period, it is necessary to see that the surface is in the right condition to act as an efficient mulch. A good mulch is one that not only checks evaporation, but also allows any rain that may fall to pass freely through it to the soil below. In seasons like the present when the rainfall is low, advantage must be taken of every useful fall of rain, and this is particularly important during the spring and summer. Rain will pass through a mulch of coarse soil, varying from about the size of gravel to road metal, far more quickly than it will through a mulch of dust. Moreover, a coarse mulch is more lasting, as it does not become caked by rain so readily.

In some cases where there has been no weed growth since the winter ploughing it is quite possible that the soil is still in a condition corresponding to a good mulch, and it is better not to disturb this condition until the mulch has been destroyed in some such way as by heavy rains or by tramping down during spring spraying operations. Whether it is necessary to reform the mulch or not at the present time, any weed growth must be destroyed, not forgetting that which is close under the trees and which cannot be reached by the horse or power implements.

As fruit trees are, generally speaking, deeper rooted than field crops the dry soil mulch in the orchard can be deeper than on ordinary cultivation land.

Pests and Diseases.

As all the coming season's troubles with codlin moth will arise from the carry-over grub, the first stage in the campaign against the moth is the destruction of the grubs to the utmost ability. All bandages, loose bark,

and crevices should be searched and grubs destroyed, and any cases, picking boxes, bins, &c., that held fruit during the previous season or winter should be dipped under boiling water for not less than three minutes. All packing house equipment should be searched and the packing shed and other buildings in which fruit has been held should be made moth-proof and locked up. It is essential that this work be completed before the first emergence of the moths this season.

A few varieties of apples and pears (chiefly grown in coastal districts) may be ready for the calyx application of lead arsenate during September, but the main varieties in the inland and tableland districts will not be ready till the latter part of October.

Provision must be made between the spur bursting and pinking stages for the initial sprays to check black spot and mildew of apples and pears in districts in which they occur. Later applications will depend chiefly on weather conditions.

Black cherry aphis and green peach aphis were dealt with in earlier notes this season, but peach growers should also keep a keen watch for black peach aphis, and should spray with nicotine sulphate or tobacco wash as soon as the aphides appear. Using a high pressure and drenching spray, the nozzle should be held close to all infested parts in order to break up the clusters. The trees should be examined within two or at the most three days, and the application should be repeated at once if any live aphis can be found.

Grape growers should take initial precautions against black spot. The first Bordeaux mixture sprays will also protect the vines from an early attack of downy mildew, and weather conditions later on will determine what other applications may be necessary.

Where growers have failed to establish the *Aphelinus mali* parasite of woolly aphis they should arrange for supplies of parasitised aphis from some other orchard. If any grower has difficulty in obtaining a supply in this way he should apply to the Department of Agriculture.

Leaflets on all the pests and diseases named above, together with a good many other common troubles, can be obtained free from the Department of Agriculture on application.

Stocks.

There have been a fair number of enquiries of late in reference to seedling stock for apples. No doubt this is because Northern Spy has not been universally satisfactory of recent years, but it would be wise to be cautious about using promiscuous seedlings as stock for Granny Smith apples. In various localities there are Granny Smith trees, robust in growth, but only yielding light crops of small inferior fruit. The evidence is by no means conclusive, but there is a suspicion that these trees have been worked on seedling stock.

In some districts there are beds of old, well grown Granny Smith trees which are known to have been root-grafted on roots other than Northern Spy, and which crop satisfactorily, bearing an excellent type of fruit. Where one wishes to avoid Spy stock, it would be wise to have trees worked from the top and roots of the best trees in these root-grafted beds, the material being chosen from trees showing good growth, heavy yields, and good quality fruits. This, of course, will apply where a grower is planting in a soil and climate similar to that in which the parent trees are growing.

A similar selection from good trees should be made when Kentish suckers are being secured for cherry stock.

To Cross-pollinate J. H. Hale Peach.

The peach J. H. Hale has not gained much favour with growers generally in this State, but in a few localities it appears satisfactory. Recently there have been repeated references in fruit literature from the United States to the self-sterility of this variety, and it is also stated that Elberta appears to pollinise J. H. Hale satisfactorily.

Market Good Crops through Good Cows.

THE aim of the dairyman should be to market a large portion of the crops grown on his farm through his cows, but it should be borne in mind that the kind of crops grown and the way they are fed has a lot to do with their ultimate value when marketed as dairy products. As far as possible the dairyman should avoid sending good crops to market through poor cows.—T. HAMILTON, in the *Rhodesia Agricultural Journal.*

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1927.

Society and Secretary.		Date.	Society and Secretary.		Date.
Cowra (E. P. Todhunter)	Sept.	13, 14	Corowa (H. G. Norton)	Sept.	30, Oct. 1
Albury (A. G. Young)	,,	13, 14, 15	Ardlethan	Oct.	5
Barmedman (S. S. Penberthy)	,,	14	Quandialla (V. Talbot)	,,	5
Murrumburrah (W. Worner)	,,	20, 21	Hay (G. C. McCracken)	,,	5, 6
Canowindra (W. E. Frost)	,,	20, 21	Narrandera (M. F. Murray)	,,	11, 12
Temora (A. D. Ness)	,,	20, 21, 22	Carcoar (V. H. Pillenger)	,,	12
Singleton	,,	21 to 23	Ariah Park (M. Collings)	,,	12
Boorowa (W. Thompson)	,,	22, 23	Bribbaree (J. Austin)	,,	12
Sydney Royal Spring Fair (G. C. Somerville)	,,	27 to Oct. 1	Deniliquin (P. Fagan)	,,	18, 19
Barellan (W. Colville)	,,	28	Griffith (W. Sellin)	,,	18, 19
Barmedman	,,	28	Millthorpe (W. P. Smith)	,,	18, 19
Eugowra	,,	28	Cootamundra (W. W. Brunton)	,,	25, 26
Finley	,,	28	Lismore (H. Pritchard)	Nov.	16, 17, 18
Hillston (J. Peevers)	,,	30	Orara (H. E. Hindmarsh)	,,	29, 30
			Albion Park (H. R. Hobart)	Dec.	31, Jan. 2

1928.

Dapto (E. G. Coghlin)	Jan.	13, 14	Taree (R. Plummer)	Mar.	7, 8, 9
Cessnock (D. B. McGilvary)	Feb.	16, 17, 18	Armidale (A. McArthur)	,,	13 to 16
Newcastle (E. J. Dann)	,,	21 to 25.	Kempsey (N. W. Cameron)	,,	21 to 23
Dorrigo (J. H. Skeoch)	,,	29, Mar. 1	Blayney (J. H. Moore)	,,	27, 28
West Maitland (M. A. Brown)	,,	29 to Mar. 3	Sydney Royal (G. C. Somerville)	April	2 to 11
Nimmitabel (R. Draper)	Mar.	5 to 8			

VOL XXXVIII. PART 10 OCTOBER 1, 1927.

Agricultural Gazette of New South Wales.

Farm Forestry.

I. THE USES OF TREES ON FARM AND PASTORAL AREAS.

R. H. ANDERSON, B.Sc. (Agr.), Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, Sydney University.

IT is the intention of the writer to contribute a series of articles dealing with the question of farm forestry, or the cultivation and maintenance of trees on farm and pastoral areas for various purposes. It is proposed to deal with the various capacities in which trees may be usefully employed, methods of raising stock, preparation of the ground and planting, care of growing trees, natural regeneration of worn-out tree areas, planting distances, and protection methods. A section will be devoted to a brief account of the principal species occurring in each division of the State and their main uses from the farmer's point of view. A list of species suitable for planting for the various purposes outlined will also be given.

The present article deals with the many ways in which trees may be grown with advantage on farm and pastoral areas.

General Benefits of Forests and Forest Cover.

The existence and preservation of forest cover and tree life in general is intimately associated with the prosperity, fertility, and comfort of any country. A land bare of trees is bleak, barren, and uninviting. Before going on to particular details dealing with the smaller unit of a farm area, the influence of forest cover on the larger unit of districts, or even countries, might be briefly reviewed. Apart from supplying us with our timber and fuel requirements, forests play a very important part in other directions.

Forest Cover Prevents Erosion.

In the first place, they provide the best means of combating erosion due to either rain, stream, or wind action. The removal of forest cover on elevated land, particularly on the watersheds of stream systems, results in increased erosion and floods.

Under forest conditions on elevated lands the rainfall is absorbed gradually into the subsoil, finally making its way out at a lower level to feed gently-running streams and springs. On the destruction of timber the surface soil becomes hardened and is unable to absorb the rainfall, which rushes off on the surface, resulting in ever-increasing erosion. On forest soil the rainfall flows *under* the ground, but on treeless soil the water is carried off mainly on the surface.

The effects of erosion are not limited to the more spectacular and obvious forms of channeling, but are often imperceptible. The finer and more fertile particles of soil are slowly washed away, the land gradually becoming more impoverished without the farmer realising the real cause of its

deterioration. On areas denuded of forest cover the rain runs off rapidly and unchecked, bearing considerable quantities of silt and debris. This is carried down to the lower reaches of the river, resulting in a silting up of the bed of the stream and a covering of the fertile flats with loose debris. Owing to the increased run-off and the shallowing of the river bed, floods become more common. Irrigation, especially from natural rivers, is interfered with, as the removal of forest cover has resulted in floods in winter, when water is not needed, and intermittent stream flow in summer, when a steady supply of water is required. Artificial reservoirs are silted up, and the lessening of stream flow during summer months results in interference with navigation and loss of water power.

Loss of good agricultural land by erosion is all too common in parts of this State. Instances were quoted in the summary of answers to a questionnaire on the subject which was published in the September issue of the *Agricultural Gazette.*

The erosive action of wind is also hindered by forest cover. If excessive clearing is carried out in areas where light soil predominates, wind action results in erosion of the soil and the formation of drifting sands. Some of the mallee country cleared for wheat-growing shows indications of soil drift. In drier parts the removal of what little forest cover exists gives rise to the "scalded plains" and wind-swept areas, the process being further hastened by overstocking and rabbit depredations.

Forest Cover and Rainfall.

Forest cover has also a direct effect on climate, tending to make it more equable. It reduces to some extent the temperature of air and soil, and, although contrary to general opinion, forests usually have little effect upon the total annual rainfall over an extensive area, they tend towards a more even distribution of the rainfall throughout the year. But what is more important still, they conserve the rain that falls, the loss by evaporation and run-off being considerably reduced. An average rainfall in forested districts is, therefore, generally of greater advantage than a heavy rainfall on treeless areas.

Summing up, forest cover benefits the farmer and pastoralist by meeting his timber and fuel requirements, by preventing erosion of his soil, by regulating stream flow and making irrigation possible, by preventing the silting up of dams and reservoirs, by conserving rainfall, and by making the climate a healthier and more comfortable one.

USES OF TREES ON THE FARM AND PASTORAL AREA.

Coming now to the smaller unit of an individual farm or pastoral area, it may be noted that trees can be usefully employed in the following capacities:—

1. As windbreaks and shelter belts.
2. As isolated or scattered shade and shelter trees.

3. As a reserve supply of fodder for periods of drought.
4. As tree plantations to supply the timber and fuel requirements of the farm, in addition to providing a source of revenue by the sale of products.
5. As screens around dams and tanks to prevent silting up by dust, and undue evaporation of the water contents.
6. As a means of preventing erosion on slopes and along the banks of creeks and rivers.
7. As a means of enriching worn-out or poor land.
8. As ornamental trees in improving the appearance of the homestead.
9. As bee trees.

Windbreaks and Shelter Belts.

Windbreaks and shelter belts play an important part in the economy of farm management, and practically every district in New South Wales has a greater or lesser need of them. This statement is borne out by the result of the farm forestry questionnaire recently distributed by the Department, when over 85 per cent. of replies indicated that windbreaks and shelter belts were of particular value in their district. Very little, however, has been done in New South Wales in providing efficient breakwinds. Reliance has been placed on the existence of natural belts of timber and the shelter provided by adjacent forests. As the country became more open the need for breaks was increasingly felt, and here and there spasmodic efforts were made to form the necessary shelter. In many cases a single line of trees has been planted, the lower branches of which soon become scanty and allow the wind to pass through unchecked. In some cases good breaks have been formed round orchards, but, generally speaking, little has been done towards making efficient plantings. In the past, doubtless, the need for breaks in many districts has not been so great, but present and future needs make it imperative to give attention to this subject.

Advantages of Windbreaks.—Briefly, what are the advantages to be gained from windbreaks? Firstly, they break the mechanical force of the wind, thus preventing undue damage to orchards by breaking off limbs, blossoms, and fruits. The production of blossoms, fertilisation, and maturing of fruits cannot be satisfactorily carried out in places open to the full force of high and frequent winds. Further, the lodging and damage by wind of other farm crops, such as maize, &c., can be prevented largely by suitable shelter belts.

Secondly, they provide a very necessary shelter for stock of all descriptions. To see a mob of cows or sheep huddled beneath a tree during the bitter winds of winter is to realise that the health and well-being of stock demand the provision of some efficient shelter. Too much food material is wasted in "warming the wind," or in meeting the increased demands of an exposed body. Sheltered animals require less food. Stockowners agree that mortality among sheep, particularly during lambing and shearing seasons,

would be considerably lessened if good shelter were available. Animals clearly demonstrate their need for shelter, and if the stockowner were to provide it he would add considerably to his profit.

Thirdly, windbreaks prevent soil erosion and removal of topsoil due to unrestricted wind action. This is particularly in evidence where light soil predominates and little natural cover exists. The effects of dust storms are mitigated.

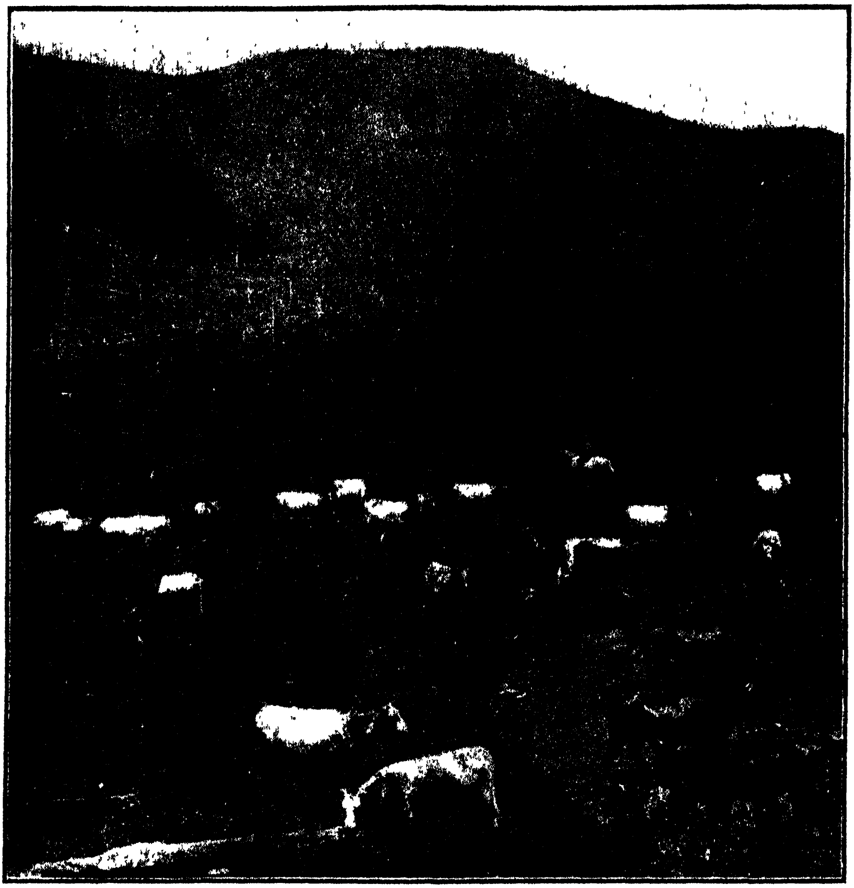


Fig. 1. - Standing Timber Totally Destroyed.
No provision made for cattle shelters, and forces of erosion allowed full scope.

Fourthly, they reduce evaporation and help to conserve the soil moisture. Where the wind is unrestricted, evaporation goes on at a rapid rate, and in most of our New South Wales districts the existing rainfall is barely sufficient for crop needs. It therefore becomes necessary to conserve what moisture already exists. In the immediate lee of a windbreak evaporation is reduced by as much as 60 per cent., and actually at one point it has been

shown, under ideal conditions, to reduce evaporation by 70 per cent.. The protective zone of a break varies with local conditions, but, generally speaking, it shelters an area equal in width to six to fifteen times the height of the trees. A narrow strip is also protected on the windward side. In the protected zone the average reduction in evaporation falls round about 30 per cent., the moisture retained in the soil being available for crop needs. The actual result of a breakwind in reducing evaporation is therefore equivalent to a fairly large increase in rainfall. Areas unsuited for certain crops by reason of an insufficient rainfall might, therefore, be made to grow them profitably if protected by efficient breaks.

Fifthly, when planted near dwellings they add greatly to the personal comfort of the farmer by protecting the home buildings from the extremes

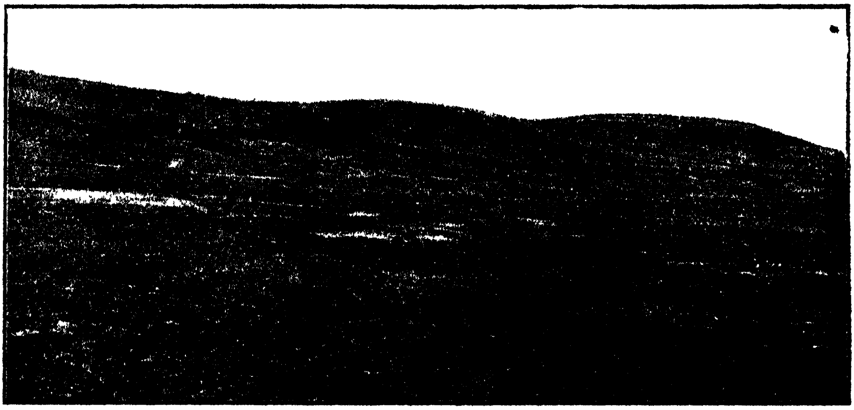


Fig. 2.—Land rendered Worthless by Erosion.
This area once carried forests of good timber trees, which have all been destroyed.

of winter cold and summer heat, and from dust storms. The home is made an infinitely more pleasant place to live in if the owner will go to the small amount of trouble entailed in planting a belt of trees.

Lastly, when planted on a big scale they can be made a source of timber and fuel supply for farm needs, and even assume the character of a tree plantation, the advantages of which will be dealt with later.

Are Windbreaks Harmful?

The advantages of breakwinds and shelter belts are, therefore, of a rather obvious character, but to be quite impartial any drawbacks must also be noted.

In the first place, a breakwind occupies a fair amount of ground, and where land is valuable the owner might hesitate before devoting it to tree growth, as the area so occupied is lost as regards ordinary crop production. On the other hand, such an area must be regarded as producing a valuable crop of a different sort, viz., fuel and timber, and at the same time as benefiting and increasing ordinary crop production in the sheltered area. The

protective value of a break is at least equal to the yield of a strip as wide as the height of the trees, and under most conditions would exceed this. The area bearing windbreaks, therefore, would result in an increase of yield in excess of that from a similar area of ground, but unprotected. Even supposing that the windbreak has no timber value, it pays rental on the ground occupied equal to that from crops, by protection alone. In single-row breaks the area occupied is really only that of a fence, and the beneficial effects far exceed the damage done by shade and sapping. The timber, on the other hand, will be knotty and only suitable for posts and rough purposes.

Fig. 8.—The Bare Ugliness of a Treeless Farm.

Another disadvantage is that trees composing the breaks rob adjoining ground of moisture and food material. The amount of mineral substances lost may practically be disregarded, as the majority of plant-foods removed are returned to the soil in the form of leaf litter.

Loss of moisture by sapping is evident in a fairly wide zone, and varies according to a variety of conditions. The degree of loss depends primarily on the extent of the lateral and particularly surface development of the trees' root systems, and this in turn depends on the species of tree, amount of available moisture in the soil, fertility and texture of the soil, and the nature of the subsoil. Where the soil is light and poor, the subsoil impermeable, and the rainfall low, lateral and surface rooting is marked, as the roots have to travel far afield for moisture and food. Some tree species

are particularly vigorous in their development of lateral roots, and where land is valuable only those species should be planted which rob as little as possible adjoining soils.

The effect of sapping will be felt most by annual crops and least by perennials with deeper and more extensive root systems. The effects of sapping can be reduced to a minimum by deep ploughing or even trenching every year along the windbreaks to cut off surface roots, and by deeply ploughing the site for the break before planting, so as to encourage deep rooting. Shading has often a more serious effect on adjoining crops than sapping, and where fairly extensive can be overcome by planting a strip, including all the shaded area, with crops such as lucerne, clovers, grasses,

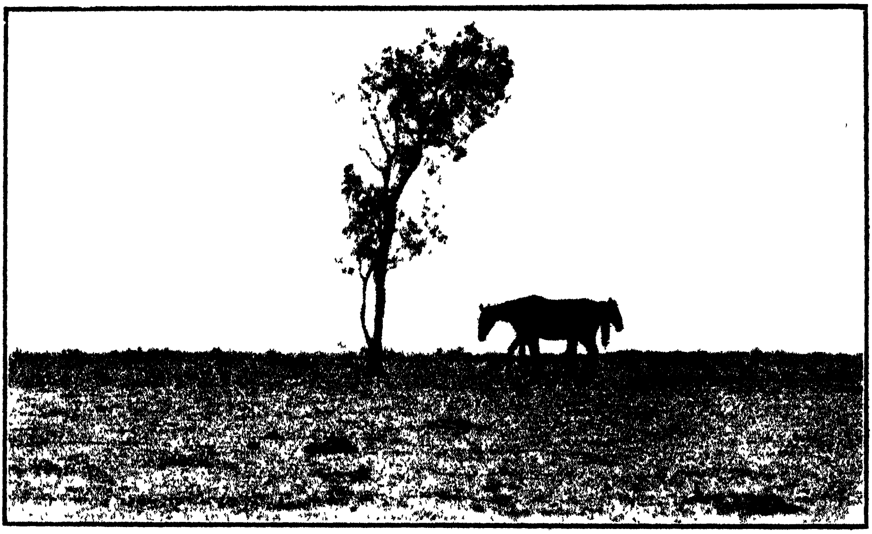


Fig. 4.—Melancholy Testimony to the Need of Shelter for Stock.
Let them have something better than this.

&c., whose value is not dependent on the production of seeds and fruits. Growth of the vegetative parts of crops is not so materially affected by shady conditions.

Usually, however, the crop gain in the protected zone is more than sufficient to balance the effects of shading and sapping. It would appear, therefore, that the balance is heavily on the side of the breakwind, and its claims can hardly be ignored by the orchardist, farmer, or pastoralist.

Shade and Shelter Trees.

Scattered single trees or clumps of trees are necessary, particularly on pastoral and dairying areas, for the protection of stock during the heat of summer and the cold winds of winter. In many districts paddocks have been cut right over when clearing, and no provision made for shelter or shade trees. In our western districts especially stock have an imperative

need of sufficient shade for summer months, and in big open paddocks they are usually found gathered under the sparse shade of the few trees left standing.

Generally speaking, the settler has been too free with the axe in certain districts, and he frequently justifies his action by stating that it was necessary in order to provide a good growth of grass. Standing trees, however, within limits, do not interfere with the value of land from a pastoral point of view. Out in our western districts trees undoubtedly improve pasture land, apart from their shade and fodder value. When denuded of trees the surface soil is swept away. Moreover, the leaves provide a litter in which the seeds of native grasses lodge and find a suitable seed-bed.

Experimental work in other countries has shown that, although treeless areas frequently carry the best grass for the first ten or twelve years, after that period their value as pasture steadily deteriorates, until they sometimes become converted into barren wastes. On the other hand, treed pastures, provided they receive correct attention, maintain their fertility more or less indefinitely, and are markedly superior in periods of drought.

Shelter and shade trees might be provided with advantage around stock yards, sheep pens, &c. Animals herded in these enclosures require some protection, and shelter trees would benefit stock apart from adding to the appearance of the place.

Fodder Trees.

The advantage of having fodder trees on pastoral areas has been so frequently demonstrated during periods of droughts that most pastoralists recognise their importance and are providing for them to some extent. Fodder trees also function as shade and shelter trees, and thus have a double value, but shade trees other than fodder trees should also be provided for, as fodder trees when lopped cease to function as shelter trees, and this at a time when shade is urgently required, viz., droughty periods.

In many parts of the Western Division drought years are fairly regular in their occurrence, and it becomes a matter of common sense to make provision for them. Fodder trees provide feed, which, although often of moderate nutritive value, should only be regarded as a famine standby. Their real value is in tiding stock over a period when grass and other herbage has failed.

In many districts nature has provided a large number of useful fodder trees, and these should be conserved by careful lopping and protection. In the past many valuable fodder trees have been destroyed by ruthless lopping or cutting down the whole tree, drovers and people with no permanent interest in the district being the worst offenders.

Lopping necessitates a certain amount of care and labour, but any trouble taken is amply repaid by conserving intact the source of supply for future years. Many of our native trees will stand fairly heavy lopping, but the degrees of severity varies with different species. Some trees require two or three good leaders to be left uncut, whereas other species will stand a

general pruning. Cuts should be made as cleanly as possible, in order to prevent undue injury to the tree and the subsequent entry of fungus and insect enemies. Lopping can also be made a method of improving the shape of the tree and increasing its future yields of leafy material.

Care Necessary when Scrub-cutting.—A number of precautions should be taken when scrub-cutting for stock. In the first place, it is not advisable to let the stock become weak before cutting is commenced. Scrub feed will keep healthy stock in fairly good condition, but once they are allowed to become weak and poor the effects of scrub feeding are not so beneficial.

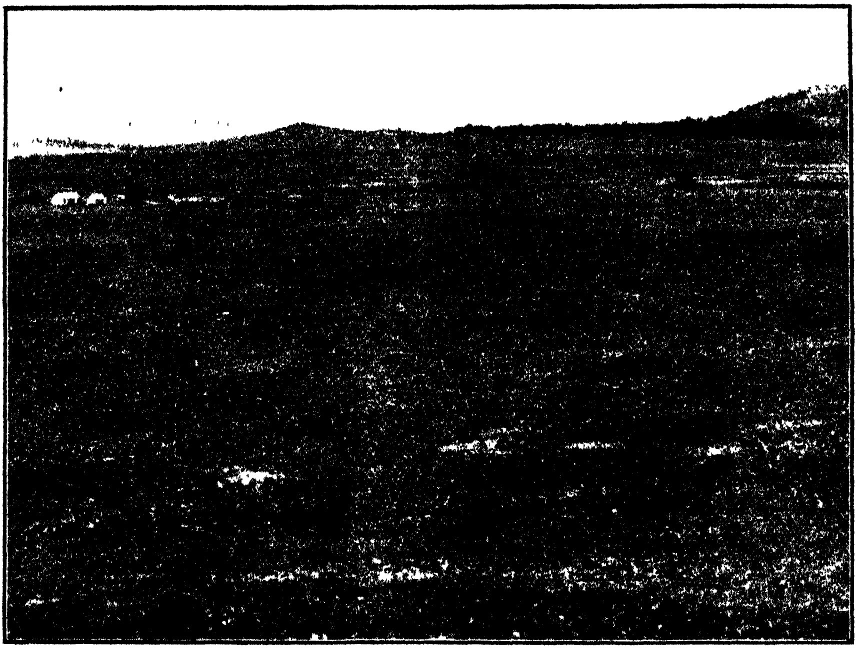


Fig. 5.—A Naturally Treeless Area on the Southern Tableland.
Planting must be resorted to where no natural growth occurs

In the second place, it is advisable to mix the ration as much as possible, that is, to cut from several species. If fed solely on one species the stock frequently suffer, whereas a variety makes for a better balanced diet. In the absence of succulent food, constipation and impaction are likely to occur among the stock, and Mr. Max Henry, Chief Veterinary Surgeon, recommends the use of a lick made up of 5 to 15 per cent. Epsom salts, 5 per cent. bonemeal, and the balance Liverpool salt. If available, molasses could be used to increase the palatibility of the lick.

Experience with fodder trees varies considerably, even in the one district. A certain tree may be regarded as extremely useful by one stockowner, whereas his neighbour may have a poor opinion of it.

Evidence as to fodder value is very contradictory, but probably if we were in possession of all the facts such contradictions would be easily explained. Certain trees, however, are very puzzling. The wilga is a tree which is apparently relished by stock in certain parts and rejected in other districts. Even in the one paddock there are certain individual trees which stock will eat, and others which they refuse to look at. Whether it is explained by a certain stage of growth, by minute specific differences, or by certain chemical differences in composition, is a matter for future investigations.

The stockowner has to form his own individual opinion, although often he can be guided by the experiences of others. Certain trees should not be fed when moist with dew or rain, and others should be cut a day or so before feeding, giving the leaves time to wilt.

Apart from the conservation of existing trees, there is much to be gained from forming plantations of the best fodder trees. Little has been done in this respect, but there are examples of well-grown plantations or small groves which reflect credit on their owner's foresight and energy. The labour involved in starting a plantation is not great, the chief items being preparation of the ground and protection from stock by a permanent fence. After planting, the trees require a little attention, especially during the first few years, but any spare time can be devoted to this work. In certain parts where conditions are very unfavourable towards tree growth, the failure of planted trees may prove disappointing, but in such districts only those species which occur naturally in the surrounding country should be planted, together with those species which have proved their hardiness. The New South Wales Forestry Commission has recognised the importance of this work, and for several years past has offered to settlers a free supply of young fodder plants, a few easy conditions only being imposed. A list and description of the main fodder trees will be given later.

Tree Plantations or Wood-lots.

In the early days of settlement the sound of the axe was loud in the land, and the noise of crashing trees was the note of progress. Forest growth was a hindrance to the spread of cultivation and pastoral areas, and under such conditions was regarded as an obstacle and as something to be destroyed. The wealth of the forest was exploited, the best species cut out and the inferior ones left in command. Wide tracts of cleared land were driven into the heart of the forests and small attention was paid to the problems of the future. These problems lay in a possible shortage of timber, the erosion of the land surface due to forest destruction, and similar changes due to interference with the balance of nature. When the settler needed timber he had only to take an axe into adjoining belts of forests. As settlement progressed these in turn were cut out, and people requiring timber and fuel were compelled to go farther afield.

To-day in certain districts there is a marked lack of timber supplies for local needs. Even fuel has to be carted 10 to 20 miles where previously it was available practically at the farmer's back door, and when timber is

required for fencing or building the farmer finds he has no longer a convenient supply. In many districts, of course, there are still ample supplies close at hand, but even in these a future shortage appears to be inevitable.

It is the business of the Government to see that the State forests are so managed that a supply of timber for future generations is assured, but it is also to the advantage of the farmer and pastoralist to see that a supply is available on his own area to meet his personal needs. No longer can he rely upon the virgin wealth of the forests surrounding him. He must grow his

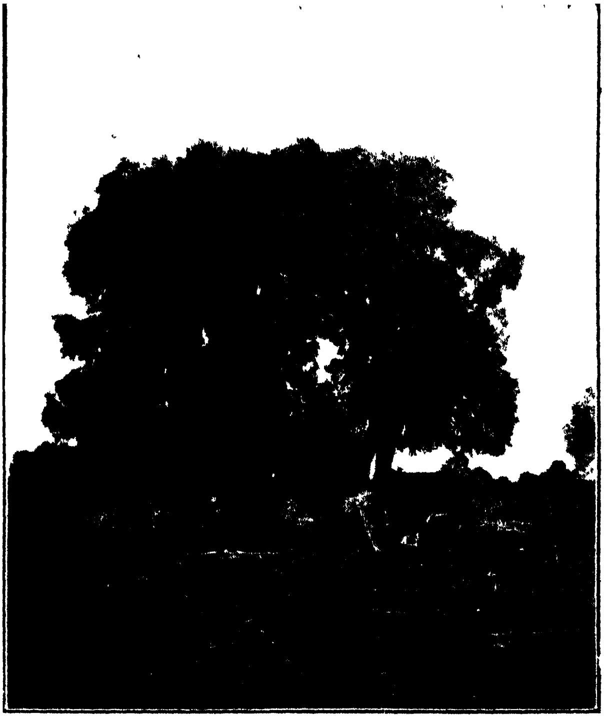


Fig. 6.—A Well Lopped Rosewood.

Fodder trees are not only conserved by careful lopping, but their yield of leafy material is increased.

own timber or buy from those who can supply his requirements. The only reasonable way of meeting the situation is by growing a plantation of trees on his holding, from which he can obtain all his timber and fuel requirements, and possibly add to his income by the sale of its products.

There is another aspect to the matter. A well-managed farm is a farm where every inch is growing the crop most suited to its particular features. Most farms have certain parts which, by reason of steepness of slope, rocky nature, poor soil, &c., cannot be profitably employed in the raising of an ordinary crop. The best way of utilising such an area is by converting it into a tree plantation. A young country such as ours has not yet felt the pressing need for such areas. In older countries the wood lot receives just

as much attention as any of the farm crops, and it is only a matter of time when similar conditions will obtain here. The wise man takes time by the forelock, and apart from those districts where definite shortages already exist, there are many areas where the future shortage can only be met by immediate planting. There is something fine about tree planting, as one is handing down a heritage to the generations yet to come.

The Practical Advantage of a Tree Lot.—What are the practical advantages of a tree lot on the farm? Primarily it would provide all fuel, wood, fencing material, poles, and any rough timber required for the homestead and outhouses. This means a saving both in time and money. Further, it would enable the farm area to be utilised to its fullest capacity, providing a profitable crop for the poorer sections. It may take the form of a windbreak or shelter belt for stock and crops. It may be so placed as to prevent erosion of the land surface on steeper slopes and along river banks. Handled correctly, it is useful in enriching the character of poor soils. It provides a breeding place for useful birds, exercises a local effect on climate, and has a real aesthetic value. In addition, the tree lot can be a source of revenue to the farmer through the sale of fuel and timber, or some such sideline as wattle-bark.

The establishment of such an area is not a difficult matter, and the cost to the farmer is represented by little more than his own time. If the property is already timbered, the indigenous species can be handled in such a way as to preserve a very useful tree lot. Details of the methods adopted will be given in a later article. The maintenance of the area provides employment for slack periods during the year.

It may be argued that the farmer will not reap the direct benefit of his sowing, owing to the long periods necessary for the maturity of a forest crop. It should be remembered, however, that the farmer will probably only plant species which are quick-maturing, that he will have the benefit of all thinnings, which, after the first five or ten years, are not inconsiderable, and that a well-established tree lot would, moreover, be a decided asset should he wish to sell.

Trees as Screens Round Dams or Tanks.

An adequate water supply is an all-important point in the drier parts of the State. Stock are largely dependent on the water gathered in open earthen tanks or dams, and during the hot dry months of summer, particularly when winds are blowing, evaporation from the surface of the water goes on unchecked, and reaches considerable proportions. Often the tank has no protection—or very little—but lies out in the open paddocks subject to sun and wind. A belt of trees on the windward side would help considerably to reduce evaporation. Stockowners agree that loss of water by evaporation often exceeds the amount taken out by stock. In one instance two similar tanks were situated in adjoining paddocks. One was protected by a belt of wilgas, whereas the other was quite bare of surrounding trees. The manager of the property asserted that the unprotected tank was always exhausted long before the other.

It would be a profitable proposition, therefore, to maintain a belt of trees on the windward side of tanks, or, in the case of cleared paddocks, to fence off an area and plant it with young trees. Such a break would also provide shade and protection for stock. Silting up would also be lessened, as in open areas a considerable amount of dust and light soil is blown into the depressions formed by the tanks.

In establishing such a shelter belt care must be exercised in choosing the site. Dams must be cleared out at intervals, and a row of trees too close to the edge would possibly interfere with the movement of horses and implements employed in removing the silt. On the other hand, if the shelter belt be placed too far from the dam its efficiency would be considerably lessened.

Fig. 7.—A Useful Natural Tree-lot of Ironbark.
Old and badly formed trees have been cut out and the balance allowed to regenerate.

The Utility of Trees in Preventing Erosion.

As mentioned before, a fair amount of good soil is lost, particularly on hilly country, through erosion. Every farmer can protect his own area by maintaining trees on those parts of his farm where erosion might be expected. The tops of small hills and ridges might be used as small tree lots, and apart from reducing erosion, would provide shelter for stock. A considerable amount of good land is frequently lost along the banks of creeks and streams. In many cases this is due to the action of flood waters, which in turn is caused by forest denudation on the watershed of the streams. The effects are aggravated by the removal of trees and shrubs along the banks of the rivers.

Many of the watercourses in New South Wales have their natural bank protectors in such tree species as river oak (*Casuarina Cunninghamii*), but these trees incidentally provide excellent fuel, &c., and have been cut for these purposes, leaving the banks open to the full force of stream flow. By trampling and breaking down the bank edges, stock hasten the process of destruction.

Some of the native trees are valuable in protecting banks, but the willow is, generally speaking, best adapted for this purpose. It is easily propagated from cuttings, is fairly fast growing, and provides fine shade and shelter. Further, it is valuable as a source of good fodder for droughty periods. A

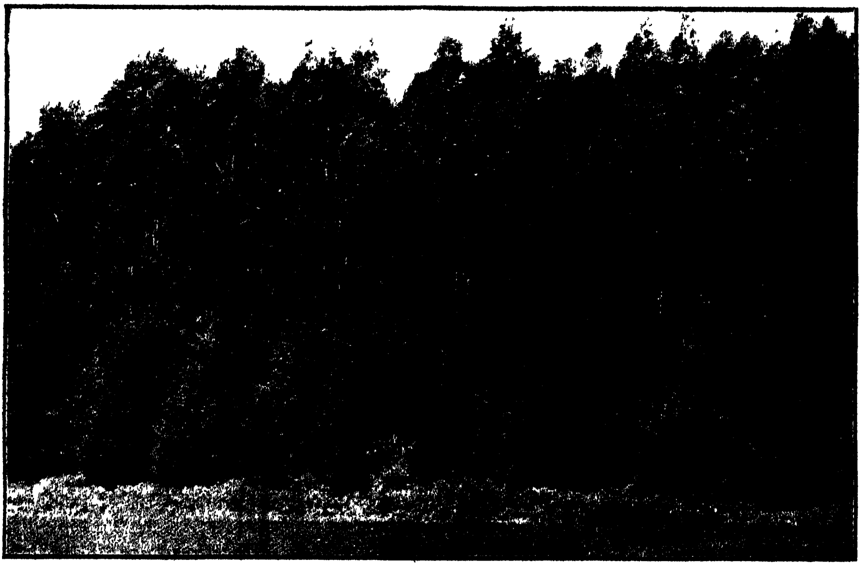


Fig. 8.—A Good Example of a mixed Shelter Belt and Tree-lot.

limb poked in the ground will often grow into a fine tree, and any care at all exercised in growing and protecting the cuttings will result in readily-grown trees. At times it is inadvisable to plant willows in small water-courses, or, at all events, close to their edges, as the trees might possibly result in the choking of the channel, and flooding, or diversion of stream flow to adjoining land. Where necessary, the banks of streams should be protected from stock by suitable fences. In some instances a tree lot might be formed along river banks, but usually the ground is too valuable for this purpose.

Soil Improvement by Trees.

Poor or worn-out soil can sometimes be made suitable for ordinary crop production by the growth of soil-improving species of trees. Very small amounts of mineral matter are removed by trees, provided the leaf litter is returned to the soil. The wood itself contains only a small percentage of

mineral substances, and the growth of a crop of trees will improve the soil from a physical standpoint, as well as adding to its supply of humus. Such soils, therefore, can be made to produce a profitable crop of trees, and at the same time improve their value for other crop production. Soil-improving species will be mentioned in a further article.

Ornamental and other Trees.

The amount of tree and shrub-planting carried out by the land-owner depends a good deal on his love of beauty, and on his pride in his home. Most people add to the appearance of the dwelling-house by planting ornamental trees and shrubs. Where care must be exercised is in the choice of species, preparation of the ground, and subsequent care and protection of the young plants. Many of the points to be given in later articles will apply equally well to ornamental trees, but the scope of this work is really limited to trees which have a practical value on farm areas.

The subject of bee trees is outside the scope of the present article.

Taking into consideration the uses of trees outlined above, it seems safe to assume that trees play an important part in the economy of farm and pastoral management, and it is only by their aid that the resources of each individual area can be most fully utilised.

"When your hand is idle, plant a tree."

(To be continued.)

White Maize Competition.

With a view to encouraging the production of white maize in this State, and of reducing the importations from South Africa, an offer was lately made to the Department of Agriculture by Kellogg (Australia) Proprietary Ltd. of a scale of prizes totalling £120, and arrangements have been made for a competition to be conducted in conjunction with the local agricultural societies and the Royal Agricultural Society, and to be judged by the Agricultural Instructors of the Department of Agriculture.

The State will be divided into four districts (the Upper North Coast, Lower North Coast, South Coast, and South-western Slopes—the Northern Tablelands being omitted for this year), and £30 will be allotted to each district, which will be distributed as first, second, and third prizes of £15, £10, and £5 respectively. The scale of points provides for points being awarded at three stages, viz., at tasselling stage for germination, cultivation methods, condition, appearance, &c.; at the ripe or harvesting stage for freedom from insect pests and diseases, purity and trueness to type, and estimated yield; and finally after the grain is harvested for suitability of the product for manufacturing purposes, a sample being sent to Kellogg (Australia) Proprietary Ltd., Sydney, for test to be made.

Forms for the information of farmers and for applications have been sent to the local agricultural societies in the districts affected. Entries must be made within two months after sowing or germination of the crop, and must refer to areas of one variety only, of not less than 2 acres in the case of the coastal districts, and 5 acres in the case of the South-western Slopes.

Hawkesbury River Maize Yield Contest.

The conditions under which this contest is conducted were altered slightly this season to allow of the testing of more than one variety instead of limiting the contest to Large Red Hogan, and as a result increased interest was taken and eighteen entries were received. Non-competitive entries were entered by the Department, as is done in maize yield contests in other centres.

Three separate plots were sown on the farms of Messrs. Charley Bros., Clarendon, J. Greentree, Freeman's Reach, and S. A. Tuckerman, Sackville Reach, the cultural details being as under :—

Clarendon.—Somewhat heavy type of alluvial soil, and block suffered through adverse weather conditions early in the season. In April, flood waters were over the maize land, but not to a sufficient depth to affect the yield. Planting took place on 7th October without fertiliser, and was done with a double dropper.

Freeman's Reach.—This block was situated close to the river, and the soil was of a free working alluvial type. The maize suffered somewhat from the dry weather, but the yields must be considered satisfactory. The seed was sown on 11th October, being covered by hand after a drill plough.

Sackville Reach.—Cutworms did a little damage to this block in the early stages, and though it showed particularly good promise of high yields, any possibility of harvesting for competitive purposes was prevented by the floods in April.

Competitor	Variety	Yield					
		Clarendon		Freeman's Reach.		Average	
		Bus.	lb.	Bus.	lb.	Bus.	lb.
R. Turnbull	Yellow Hogan (Selection)	82	35	96	14	89	24½
C. Gow ...	Leaming ...	79	1	84	42	81	15½
A. S. Holland ...	Silvermine ...	74	19	86	35	80	27
Department of Agriculture	Pride of Hawkesbury	72	18	87	9	79	41½
Hawkesbury Agricultural College	Large Red Hogan ...	68	55	90	0	79	27½
A. S. Holland	Large Red Hogan	69	53	87	43	78	48
Geo. Nicholls ..	Silvermine ...	67	35	90	0	78	15½
C. Gow ...	Yellow Hogan ...	64	53	90	17	77	35
J. Greentree ...	Large Red Hogan	69	26	77	33	73	24½
Alf. Greentree	Pride of Hawkesbury	69	36	76	14	72	53
S. A. Tuckerman	Large Red Hogan	65	35	80	0	72	45½
S. A. Tuckerman ...	Yellow Hogan ...	60	15	81	46	71	2½
Department of Agriculture	Fitzroy ...	63	35	74	42	69	8½
A. C. Hannabus ...	Fitzroy ...	73	36	60	35	67	7½
Geo. Nicholls ..	Yellow Hogan ...	56	41	58	42	57	49½
Department of Agriculture	Yellow Hogan ...	54	57	56	49	55	50
Department of Agriculture	Golden Beauty	56	15	55	0	55	35½
Department of Agriculture ..	Gimarra Whitecap	50	21	58	42	54	36½

A most noticeable feature of the competition was the high yield and substantial lead at both centres of the Yellow Hogan entry of Mr. R. Turnbull, although the types of soil were dissimilar. Mr. Turnbull states that he has been definitely selecting for fifty years, continually improving from his original Yellow Hogan to the present fixed type, which has a very deep grain and a small core, with a medium length cob and a great number of rows.—E. A. Southee, Principal, Hawkesbury Agricultural College.

Fodder Conservation for Western Conditions.

W. W. WATSON, Tichborne, Parkes.*

THE climate and rainfall of the western portion of the State have been indicating to us for many years that the best return cannot be got from the grazing areas without some system of fodder conservation. Up to the present very little has been attempted in a systematic way. Generally there is a haphazard attempt to put a little hay, grain, or silage away for use in the next dry spell that comes regularly every three or four years. We often do so, not because we think it a good investment, but because we are ashamed to admit to our neighbours that we have no reserve of food in some form or other, but not before some definite system of fodder conservation is established will the grazing and agricultural areas of the State be comparatively safe against the shortage of natural feed that occurs with the recurring years of low rainfall.

There are at least two years out of five when nature is kind to us as regards rain, and the surplus feed of those years now allowed to go to waste, would, if conserved, help us over the other two or three years of that period. The landholder who judiciously makes use of the surplus feed of those years is the one who not only is able to defy the dry years, but can add to the carrying capacity of his land over the whole five years, and has the satisfaction of knowing that the best has been done to get the maximum return from his holding.

Conserved fodder brings with it conserved confidence. Before any fodder can be conserved it must be grown, and it is a very vital point that crops of good quality should be produced for the feeding of sheep. Any roughage will keep big stock alive, but it is to advocate fodder for sheep that this paper is principally written. Most of us know of the different feed values of hay or chaff, and the different values of silage is just as vital. Quality of fodder is economic feeding. In the production of a crop for either hay or silage the ideal to be aimed at is a crop of medium height and of thin straw. We perhaps have noticed that a crop of wheaten or oaten hay grown in a year of heavy rainfall is not relished by sheep like a crop grown in a year of average conditions.

The organisation of fodder conservation competitions by the Royal Agricultural Society is a very genuine attempt to create interest in this great question, and while these competitions have not yet created the interest they deserve, the promise of a year or two of low rainfall will do more to draw the attention of the western landholder to their importance than many columns of advertising matter.

* Paper read at the State Conference of the Agricultural Bureau held at Hawkesbury Agricultural College, July, 1927.

Three Methods Available.

The fodders that can be conserved in our western districts have now practically been reduced to three, as follows:—

(1) Wheaten or oaten hay,
(2) Stored grain,
(3) Silage,

and I shall deal with them in that order.

For many years the only known method of fodder conservation was the storage of hay, but of late years I have doubted whether this means is the most economical. The wastage of hay in the State every year is enormous, not only as to value but as to actual weight. Mice, rats, rain, fire, carlessness all come into the picture in producing that waste. I believe that 30 per cent. of the hay cut is wasted and that the value is reduced nearly 50 per cent. from the time it is cut till it is either used or destroyed. Stacks by the hundred over a period of three good years lie rotting in the paddocks, ruined by pests or weather. The great problem of the landholder to-day is to find a method of adequately protecting his hay. The means adopted of late years has been to erect an iron fence about 2 feet high, which, if very carefully watched, is a fair protection from mice, but to protect against rats a fence at least 5 feet high would be needed. The hay press has been used a little during the past year or two in attempts to conserve fodder. This method is excellent as it saves about two-thirds of the space required for sheaf hay, and the bales are so much easier to handle when required for feeding, but, on the other hand, the system provides a splendid shelter for mice and rats, and the bales, if left unprotected, will be reduced to a ruined heap in a few years. Baled hay must be protected, and when one goes to the expense of growing and baling, it would be advisable to surround it with a 5-foot iron fence set well into the ground, preferably in concrete, when with adequate covering, it would be comparatively safe. This would be, I think, the best means of conserving this form of fodder.

With the introduction of fat-lamb raising there is often the need of growing winter feed in the form of oats to maintain the lambs' growth during the colder months, and to finish them for market in the early spring. There often occurs during a season of good rainfall an abundance of natural feed and the whole area sown to oats is not needed. This can then be allowed to mature and be harvested in the usual way to provide a supply of grain for conservation, cheaply produced and easily handled.

In the method of fodder conservation in the form of grain there is nothing that can compare for cheapness and efficiency with the ordinary galvanised-iron tank. If properly erected, it is safe from all pests and weather, and if the grain is put into the bin in a dry condition, as is usually the case when it is taken off with the header, there is no need to trouble about weevil. I have been keeping oats by this means for the last twenty-three years, and with the exception of the year 1916, which was one of excessive rains during harvest, I have never had any losses. I favour

bins with a capacity of 1,000 to 1,200 bushels, as one has the opportunity then of separating any variety or quality. This method is now fast becoming recognised as the best for conserving grain in bulk.

The third form in which fodder can be conserved is as silage. This is almost always done in pits in the west, and is becoming very popular. The handiest size on the average farm is about 100 tons capacity. This would be sufficient to keep 700 sheep for about five months at the rate of 2 lb. per day, and there should be very little waste. In filling a pit it is always well to remember that given ordinary care and attention, one gets out of a pit what he puts in, and the better the quality the greater the feed value. Oats or wheat should not be put in too green, or the feed will come out too mushy, there being too much moisture or sap in it. I favour wheat being cut when the flower is on it, and oats when it is just beginning to show a little colour, as oats especially are inclined to be too sappy before this stage. Wild oats would need to be pitted before then as they mature very quickly after the first colour is noticed. This form of fodder conservation is now adopted as the best method of preparing for the dry seasons, being safe from vermin, fire, and weather, and if a little care is taken to see that the surface has enough fall to take storm waters away it will last for many years.

There are possibilities also in another form of fodder conservation—the growing of lucerne on wheat lands that may be lying out of cultivation for a few years. The Parkes P. and A. Association is organising a lucerne growing competition on these lines and it promises to create considerable interest. In flush seasons when the lucerne lands may not be needed for grazing purposes, the growth can be cut and baled for use when the seasonal conditions change, and there are few fodders that can compare with the popular lucerne for stock feeding, as it supplies all that is needed to maintain sheep in good condition, is not attacked by mice and rats, and is easily harvested and handled.

The Cost of Conserving Fodder.

The approximate costs of conserving the abovementiond fodders are as follows:—

		s.	d.	
Hay in stack	.. .. ..	30	0	per ton.
Oats in silo	.. .. ..	1	6	per bus.
Silage in pit	.. .. ..	9	0	per ton

I have assumed that occasionally a self-sown crop grown in a wet season would be harvested, and also a crop that previously has been fed off, thus reducing the cost of growing by lessening overhead expenses. Oats may sometimes be harvested that have also been previously fed off, and also grown from a self-sown crop.

Silage is within the reach of most landholders, large and small, as it does not require the capital necessary to grow the other crops. A few horses, and a plough and scoop, will put down a 200 cubic yard pit in

two or three days, and with the surplus growth in an adjoining paddock it can be filled in less than a week. Practically all farmers have a plant capable of doing this, the implement that is usually missing being the inclination to do it. There is always a way where there is a will.

Finance is the greatest difficulty in fodder conservation. It takes considerable capital to put hay in stack or grain in silo, and as both these are easily saleable they are hard to keep when most needed owing to advancing prices and the need of ready money. Silage is not so easily converted into cash, and if put into the pit in good condition and care is taken to keep surface water out, it lies there as a reserve of feed that will some time be the means of saving much worry and more sheep.

Pasture Improvement and the Export Lamb Trade.

Sheep grow considerably larger frames on improved than on the natural pastures, and what parasites there may be on the ground do not find a suitable hostage in these well-nourished animals; consequently disease amongst sheep running on improved pastures is seldom seen. It will naturally follow that sheep bred and grown under these conditions will produce well-nourished, healthy lambs, and also a considerably greater percentage than those running on indifferent pastures, and these lambs, owing to the favourable conditions under which they are fattened, will be suitable for export, and able to compete with the world's market. The reason that we have, so far, failed in our export trade is that we have relied wholly and solely on our natural pastures for fattening stock, and these pastures are not nearly succulent enough to produce prime lambs and mutton, except in very good seasons.—C. E. Prell, at the State Conference of the Agricultural Bureau.

What is the Empire Marketing Board?

The Empire Marketing Board was set up by the British Government at the suggestion of the Imperial Economic Committee. It has for Chairman the Secretary of State for Dominion Affairs. His predecessor in office is also a member of the Board, and representatives of the self-governing Dominions, of the Colonies, and of British producers and consumers share with them a task of large Imperial significance.

As a body detached from party politics, but intimately aware of the economic needs of the Empire, whether at its heart or at its outermost fringes, the Board has the task of recommending grants from a fund provided yearly for the purpose by the Imperial Parliament.

The Board's policy is to stimulate the consumption within the United Kingdom of Empire products, whether grown at home or brought from overseas. To this end it aids in improving the quality of Imperial produce, by encouraging research into problems of cultivation, of resistance to the ravages of plant and animal disease, of grading and packing, of transport and marketing.

Varieties of Wheat in Relation to Soils and Rainfall.

E. S. CLAYTON and J. T. PRIDHAM.

THE remarkable variations in yields obtained from specific varieties of wheat under different conditions have long impressed officers of the Field Branch, and the suggestion presents itself that some systematic effort should be made to collect information on the subject. These variations depend to some extent, of course, on differences of soil, but they are complicated by differences of rainfall and climatic conditions, and it is suggested that, if possible, experiments should be arranged which would be continued for a considerable time on suitable farms, whose owners have the confidence of Instructors, and who are willing to make the land available.

We need more detailed information about the behaviour of varieties under varying conditions. Vilmorin even went so far as to say, "Not only is a special variety adapted for a given farm, but even for a special field a particular variety will be found more suitable than another."

A farmer in the Cowra district on fairly light upland soil gets good results with Hard Federation and Yandilla King, while a neighbour only a mile or so away has no success with these wheats, but finds that Federation and Major do well with him. In the Farmers' Experiment Plots last year at Tichborne, Federation gave 28 bushels and Canberra 42½ bushels per acre on light loam, while on clayey loam the positions were reversed, Federation giving 35 bushels and Canberra 30½ bushels. Federation seems to suit the deep loam of the Hillston district and Lake Cargelligo, but does not always seem to make quite as good use of limited moisture as Canberra. Federation yielded 23½ bushels and Canberra 32 bushels on Mr. Turner's farm, with 537 points of rain on the growing crop. On Mr. Circuitt's farm, where 717 points fell on the crop, Federation gave 38½ bushels and Canberra 35 bushels per acre. The early maturity of Canberra would in part account for this. Californian experience with Federation and Hard Federation is that, under dry farming conditions, the latter yields better than Federation, whereas, under irrigation, Federation yields best. Union appeared at Mirrool to make better use of the moisture in the fallow than Waratah. The rain during the growing period was only 636 points. At Ungarie, with very little previous rain on the fallow and 616 points on the growing crop, the reverse obtained: Waratah 21½ bushels and Union 16½ bushels, the soils in both cases being medium strong or heavy. It has been noticed that plants of this variety remain green at the nodes longer than other wheats, ripening very steadily. Sometimes, when the rainfall is good, as at Barellan in 1925, Waratah does not show to advantage, but at Hillston, Milbrulong, and Mirrool, with lighter falls, it is outstanding. Waratah tends to make too much straw, and in a rich soil, such as Mr. Gow's

at Barellan, this might account for its moderate yield on the plots there, but, judging by the results Mr. Gow obtains with his farm crops, Yandilla King and Waratah are easily his two best varieties.

Union, in 1924, at Young, on light loam gave 22 bushels, being beaten by nearly all other varieties, while at Mathoura, on heavy clay loam, it topped the yields with nearly 27 bushels, and on very strong loam at Berrigan it gave over 40 bushels per acre. In that season the yields of Union appear to have been clearly influenced by the soil, for the moisture was abundant at Young, and yet the yield was only moderate. In 1923 Union topped the yields everywhere in the south, except at Moombooldool, the heavy rainfall suiting it. In 1925 the uniformly good rainfall contributed to the success of Penny in the central-west, which, like Chant's Prolific and Dart's Imperial, stands out in good seasons. The low position of Canberra this year in this district was to be expected with the relatively high rainfall; it only retrieved its position at Gulgong under drier conditions. In 1924, on rather similar soils both at Hillston and Lake Cargelligo (Mr. Circuitt's) Early Bird gave practically the same yield, though Federation with higher rainfall at Circuitt's farm yielded much better than at Hillston. There was not a great difference in the yield of Gresley at the two places, but Currawa responded to the higher rainfall with nearly 22 bushels against 15¼ bushels at Hillston.

Yandilla King and Wandilla are two similar sorts. On results in 1924 in the western district (Dubbo centre) Wandilla seems to suit the conditions best, the heavy November rains apparently not unduly toughening the head. Major looks like another case affected more by soil than usual. In 1924, on light sandy loam at Young it gave only 23½ bushels, while at Mathoura, on a heavy clay loam, it yielded 35 bushels.

Aussie, on the other hand, gave nearly 30½ bushels at Young on light loam, and came third last in the heavy soil at Mathoura. This result seems to indicate light soils for Aussie, for under a good rainfall at Berrigan it yielded only moderately, the soil being a very strong loam. In 1923 at Barellan, on Gow's plot, on heavy black soil, Aussie came last with 11¼ bushels, while on Martin's plot it same second with 15¼ bushels. In the first case the soil was heavy, and in the second a light loam. Aussie right throughout the Riverina and South-western Slopes shows this leaning to the light friable loams rather than the heavier soils. On Mr. Fraser's farm at Dhulura, Aussie is one of the best varieties, and has yielded over 40 bushels. The soil is deep light friable loam.

In 1923 Waratah's light yield on heavy clay loam at Mathoura was probably due to heavy growth associated with insufficient rain. It is remarkable that in 1924, at Eugowra, Major and Duri on light red loam gave respectively 39½ bushels and 41 bushels per acre. The unusual season equally favoured long and short season varieties. Major might have been expected to respond in such a long growing season as 1923, but its yields were only fair. It is what Dr. Cobb called a delicate wheat, like the Purple Straw group—less hardy than Waratah, which gave very fair yields throughout that season.

In 1923 the success of Bomen in the southern districts was noticeable. The plant breeders have material in hand for a white grain Bomen, and hope to have it fixed before long. The remarkably heavy yields of Canberra in the north-west and central-west in 1920, a year of abundant rainfall, are noteworthy. The longer season varieties, Yandilla King and Marshall's No. 3, suffered from the dry months of April and May. This result was rather more pronounced in the north-west than in southern districts, because of the much shorter fallowing period. In the south the longer season sorts did relatively better.

Waratah is a remarkable variety. It appears to be particularly suited to the Riverina and South-western Slopes, and seems to be at home on both heavy clay soils and medium textured loams, in the drier parts of the district, and also for mid-season and late sowing in the moister eastern portions of the Riverina. Waratah seems to be suited to the dry district of Hillston, where the soils are medium to strong red loams, but does not yield so well as Federation or Canberra at Lake Cargelligo on the deeper light loams, as at Circuitt's, nor on the heavier red loams, as at Turner's.

Yandilla King is also an outstanding variety, especially in the Riverina and South-western Slopes. It is wonderfully suited to the moister eastern portions of the wheat belt, but also gives excellent yields in the drier parts (excluding the driest portions) provided it is sown on the heavier soils. At Eurimbla, on red clay loam, in 1925, it yielded 28 bushels, while Canberra yielded 23 bushels; at Dubbo, on medium clay loam in the same year. Yandilla King yielded 37½ bushels and Federation only 32 bushels; but at Armatree, on sandy loam, it gave only 3½ bushels, while Canberra yielded 17 bushels. Yandilla King does not do well on light soils in dry districts in average years.

Bena does not appear to be particularly suited to the driest parts of the west, south-west, or Riverina, but in moderately dry districts on heavy soils it yields well. At Barellan in 1925, on very heavy black soil (Gow's), it gave 35¼ bushels, and Federation 33½ bushels. At Coolamon in 1925 it gave 24 bushels, and Federation only 17½ bushels. At Hillston in the same year it gave 21½ bushels, but Waratah gave 27¼ bushels. At Lake Cargelligo it gave 23 bushels and Waratah 26¼ bushels on light deep soil, but on heavy soil at Turner's (Lake Cargelligo) it gave 22½ bushels, Canberra 20 bushels, and Waratah only 16 bushels. At Ungarie it gave good yields on heavy country. Bena, on the data we have at present, seems to be suited to the more favoured parts, like Young, Cowra, Harden, &c., and in the moderately dry parts it shows to advantage only on the fertile heavy soils. It does not appear to be suitable to the driest parts of the State.

Currawa seems to be remarkably suited to the light sandy mallee soils, particularly those near Moombooldool. On this class of soil this variety is unsurpassed up to the present, but it does not seem to be particularly valuable on any other class of country in the west, south-west, or Riverina. The results seem to indicate that in drier districts one hardy mid-season variety should be grown in addition to early sorts, to take advantage of a season more favourable than usual.

In considering the results of Farmers' Experiment Plots one fact strikes one with considerable force; that is, the necessity for grouping the varieties under trial according to their maturity. In dry districts, if early varieties are tested only against early and mid-season varieties, and in more favourable districts if mid-season varieties are tested against late and mid-season varieties, the results will be more valuable. If this is not done, two sowings are necessary. Where more than one trial is conducted at a centre they should be on different classes of soil to furnish the best information; if this is not done there is no reason for having two plots at any one centre, unless an early sowing is made at one and a later one at the other.

On analysing the results of trials, the great necessity for always including the same standard variety in each section becomes apparent. Experiment results are only valuable when taken over a period of years, and unless some standard variety is included in each sowing the value of the result is reduced.

There is a good deal more in this question of soil affinities of varieties than we perhaps realise, but when we hear a farmer say of some proved variety that it is a failure with him, we should not discredit his statement, as it even happens with an extraordinarily adaptable variety like Waratah. A few isolated instances have occurred where Waratah gives very poor yields, and in one notable case at Barellan, on red medium loam, this variety gave poor yields year after year compared with Federation and Canberra, though on the slightly heavier soils it yields better than any other variety.

It may be said that conditions of soil are not worth consideration, as every paddock in its turn is brought under wheat. But if we find that it pays to sow the lighter soil with a certain early maturing variety, and the heavier soil with a longer growing sort, the knowledge gained is worth while. We cannot forecast the seasons or alter climatic conditions, but if we crop the different soils to better advantage, by discriminating between varieties, we have advanced a step in production. The character of the season, of course, has much more effect than the nature of the soil, but soil variations are worthy of consideration in a study of yields and varieties.

FAVOURABLE REPORTS ON THE BANANA SQUASH.

As the result of the description of the banana squash given in the May, 1926, issue of the *Agricultural Gazette*, a great number of inquiries were addressed to the Department for seed from all parts of the State and from other States. Reports are now available of a number of cases where it was possible to supply a few seeds, and these, on the whole, are favourable. Apart from the fact that some of the seed was not pure and produced misshapen fruit, most of the growers were very pleased with the heavy yielding capacity, and the early maturity of the crop. Even whree the crop was not pure, the high eating quality was commented on.—J. DOUGLASS, Agricultural Instructor.

Notes on Wheats Entered for the Royal Agricultural Society's Show.

EASTER, 1927.

G. W. NORRIS, Chemist's Branch.

THE wheats exhibited this year were, as a whole, excellent samples of high milling qualities. The entries totalled 117, compared with 209 last year. There were, however, a greater number of individual exhibitors, representing more commercial wheat growers than ever before. The influence for good exercised by the Field Wheat Competitions is seen, not only in the quality of the wheats, but in the fact that 41 of the entries were made in two classes set apart for farmers who had taken part in the crop competitions. The quality of the grain exhibited made up for lack in quantity, and there has never been a show at which the exhibits were of such a uniformly high standard. It was a work of considerable difficulty to allot the prizes among exhibits of such high and nearly equal merit.

In some classes the wheats were all prize winners, this satisfactory position being probably due to the Royal Agricultural Society's crop competitions, which have undoubtedly done valuable work in promoting better farming methods and production of better grain.

For the first time, the milling was carried out on the mill imported from America by the Royal Agricultural Society some years ago. After several small alterations had been made it worked satisfactorily, and the mill products compared very favourably with those of the best commercial mills in Sydney. The percentages of the different mill products were highly satisfactory. The flour yields in most cases were exceptionally high, while the by-products—bran and pollard—were clean, the bran in most cases being very broad.

The prize money (nearly £200) was distributed in amounts of £2 10s. to over £30 between nineteen different exhibitors.

The following tables give the result of the examinations of the competing samples, viz., weights per bushel, milling tests, and awards.

WEIGHTS PER BUSHEL.

Catalogue No.	Variety.	Bushel Weight.	Catalogue No.	Variety.	Bushel Weight.	Catalogue No.	Variety.	Bushel Weight.
				Class 1245 (Strong Flour, Red).				
7905	Cedar ...	... 68	7906	Cedar ...	... 67	7907	Cedar ...	... 67
				Class 1246 (Strong White).				
7908	Bruce ...	... 66¼	7911	Minister...	... 64½	7914	Comeback	... 67¾
7909	Pusa No. 4	... 67½	7912	4 P ...	... 66½	7915	India Pusa	... 67¼
7910	Comeback	... 66	7913	Bobs ...	... 67¼	7916	Quality ...	... 66¾

Weights per Bushel—*continued.*

Catalogue No.	Variety.	Bushel Weight.	Catalogue No.	Variety.	Bushel Weight.	Catalogue No.	Variety.	Bushel Weight.
Class 1247 (Medium Strong).								
7917	Canberra	66½	7921	Canberra	67	7925	Canberra	66
7918	Baroota Wonder	66½	7922	Carrabin	66½	7926	Defiance	66¼
7919	Canberra	65½	7923	Canberra	67¼	7927	Bomen ...	64¾
7920	Yandilla King	65½	7924	Gresley ...	65½	7928	Canberra	66
Class 1248 (Special Prize—Florence).								
7929	Florence	65	7930	Florence	65¼	7931	Florence	65¾
Class 1249 (Special Prize—Canberra).								
7932	Canberra	65½	7935	Canberra	66½	7937	Canberra	66
7933	,,	67	7936	,,	66	7938	,,	66
7934	,,	67¼						
Class 1250 (Special Prize—Waratah).								
7939	Waratah	64½	7942	Waratah	66	7945	Waratah	64
7940	,,	65¼	7943	,,	66	7946	,,	66¼
7941	,,	66	7944	,,	61½	7947	,,	66½
Class 1252 (Special Prize—Bena).								
7949	Bena ...	63½	7951	Bena ...	64	7953	Bena ...	65
7950	,, ...	63½	7952	,, ...	66	7954	,, ...	65¼
Class 1253 (Special Prize—Federation [Novice].)								
7955	Federation	65¼	7956	Federation	65¾			
Class 1254 (Special Prize—Federation [Open]).								
7957	Federation	64¾	7958	Federation	65¼	7959	Federation	65½
Class 1255 (Special Prize—Hard Federation).								
7960	H. Federation	66¼	7961	H. Federation	66	7962	H. Federation	64½
Class 1256 (Weak Flour).								
7963	Petatz Surprise	67¾	7967	Major ...	65	7970	Turvey ...	65
7964	Waratah	65¼	7968	Moira ...	67	7971	Waratah	66½
7965	,,	66¼	7969	Federation	65½	7972	,,	66½
7966	,,	65½						
Class 1259 (Special, Strong White).								
7977	Comeback	67	7979	Pusa No. 4	64	7980	Quality ...	66½
7978	Minister	64½						
Class 1260 (Special, Medium Strong).								
7981	Bena ...	63¾	7988	Bena ...	63	7994	Bomen ...	64¾
7982	Yandilla King	65½	7989	Yandilla King	65¾	7995	Marshall's No. 3	64
7983	Carendon	65¾	7990	Canberra	66¼	7996	Early Bird	67
7984	Yandilla King	64¼	7991	Hard Federation	65	7997	Bena ...	64
7985	Canberra	67	7992	Bena ...	64	7998	Yandilla King	63¼
7986	Bena ...	63¾	7993	Yandilla King	62¼	7999	Canberra	66¼
7987	Yandilla King	61¾						
Class 1261 (Special, Weak Flour).								
8000	Turvey ...	64	8008	Waratah	66¼	8015	Waratah	63¾
8001	Waratah	64¾	8009	Turvey ...	63¾	8016	Federation	63
8002	,,	65½	8010	Waratah	64¾	8017	Waratah	64
8003	,,	65¾	8011	Turvey ...	63¾	8018	Aussie ...	66¼
8004	,,	65¼	8012	Waratah	66	8019	Turvey ...	63¼
8005	,,	65½	8013	,,	65	8020	,, ...	63
8006	,,	62¼	8014	Federation	63	8021	Waratah	64¾
8007	Turvey ...	62¼						

RESULTS OF MILLING TESTS.

	Appearance of Grain.	Weight per bushel.		Ease of Milling.	Percentage of Flour.		Colour.	Percentage of Gluten.		Strength.		Total Pts.
	—	Points.	Actual Weight.	—	Points.	Actual per cent.	—		Actual per cent.	Points.	Water Absorption.	—
Max. Points.	10	15		10	10		15	20		20		100
Class 1245 (Strong Flour, Red).												
7905	9	15	68	8	8	72·2	11	15½	11·7	17½	52·5	84
7906	9	14	67	8	10	74·2	13	16	12·0	17	52	87
7907	9	14	67	8	9	73·2	15	15	11·2	18	53	88
Class 1246 (Strong, White).												
7909	10	14	67¼	8	10	73·8	14	14½	10·5	20	55	90½
7910	10	13	66	8	10	75·9	12	16	12·0	17	52	86
7912	10	13½	66½	8	10	75·6	14	17	12·8	12	47	84½
7915	10	14	67¼	8	10	74·3	12	16	12·1	15	50	85
7916	10	13½	66½	8	10	74·2	13	16	12·3	11	46	81½
Class 1247 (Medium Strong Flour).												
7917	9	13½	66½	10	10	74	14	16	12·3	9½	44·6	82
7920	9	12½	65½	10	10	75·1	12	17½	13·6	9	44	80
7921	10	14	67	10	6	70	12	14	10	11½	46·8	77
7922	10	13½	66½	10	10	75·1	12	16	12·3	11½	46·8	83½
7925	10	14	67¼	10	9½	73·6	14	14½	10·7	10	45·2	82
Class 1248 (Special Prize—Florence).												
7929	9	12	65	9	10	74	12	15½	11·4	11	46	78½
7930	10	12½	65¾	9	10	74·3	12	17½	13·6	11	46	82
Class 1249 (Special Prize—Canberra).												
7932	9	13½	66½	10	10	74	13	16	12·3	9½	44·6	81
7933	10	14	67	10	6	70	12	14	10	11½	46·8	77½
7934	10	14	67½	10	9½	73·6	14	14½	10·7	10	45·2	82
7935	10	13½	66½	10	10	75	15	16	12·1	11½	46·6	86
7938	10	13	66¼	10	10	75·7	14	13½	9·5	11	46	81½
Class 1250 (Special Prize—Waratah).												
7940	10	12	65½	10	9½	73½	11	16	12·1	8	43	76½
7942	9	13	66	10	8½	72·4	14	12½	8·5	9½	44·6	76½
7943	9	13	66	10	10	74·6	13	16	12·1	9½	44·6	80½
7946	10	13	66½	10	9½	73·4	12	16½	12·5	9	44·2	80
7947	9	13½	66½	10	9½	73·7	12	13	9·1	9	44·2	76
Class 1252 (Special Prize—Bena).												
7953	9	12	65	10	7	71	13	13½	9·4	9½	44·3	74
7954	10	12	65½	10	8½	72·5	12	15½	11·4	9	43·8	77
Class 1254 (Special Prize—Federation) [Open].												
7958	10	12	65½	10	7½	71·7	13	13½	9·8	9½	44·6	75½
7959	10	12½	65½	10	8	72·2	14	14	10·0	8½	43·6	77
Class 1255 (Special Prize—Federation) [Hard].												
7961	10	13	66	10	10	76·2	14	18	13·8	11	46	86
7962	10	11½	64½	10	7½	71·6	13	14½	10·6	12	47	78½
Class 1256 (Weak Flour).												
7963	10	14½	67¾	10	10	73·7	13	14	10	11	46	82½
7964	10	12	65½	10	10	73·5	11	16	12·1	8	43	77
7968	10	12	65	10	10	73·9	12	13	9·2	8½	43·6	75½
7969	10	12½	65½	10	9	73·1	12	14½	10·4	7½	42·8	75½
7971	10	13½	66½	10	10	74·5	15	17½	13·5	9	44	85
7972	9	13½	66½	10	9½	73·7	12	13	9·1	9	44·2	76

SOCIETY'S CHAMPIONSHIPS.—FIELD WHEAT COMPETITIONS.

	Appearance of Grain.	Weight per bushel.		Ease of Milling.	Percentage of Flour.		Colour.	Percentage of Gluten.		Strength.		Total Pts.
	—	Points.	Actual Weight.	—	Points.	Actual per cent.	—	Points.	Actual per cent.	Points.	Water Absorption.	—
Max. Points.	10	10		10	10		20	20		20		100
Class 1259 (Special Prize—Strong White).												
7977	10	14	67	8	10	74·8	12	16	12·1	17	52·2	87
7980	10	13½	66½	8	10	74·2	13	16	12·8	11	46	81½
Class 1260 (Special Prize—Medium Strong).												
7982	9	12½	65½	10	10	75·1	12	17½	13·6	9	44	80
7983	10	12½	65¾	10	10	75·9	13	19	14·9	10	46	84½
7985	10	14	67	10	6	70	12	14	10	11½	46·8	77½
7990	9	13	66¼	10	10	74	15	16½	12·8	9	44·2	82½
7991	10	12	65	10	10	74·6	14	14·2	11·6	12	47	82½
7996	10	14	67	10	10	75·6	15	16½	12·7	9½	44·6	85
7999	10	13	66½	10	10	75·7	14	13½	9·5	11	46	81½
Class 1261 (Special Prize—Weak Flour).												
8002	10	12½	65½	10	9½	73·7	15	15	11·2	9	44·2	81
8005	10	12½	65½	10	9½	73·7	15	15	11·0	9	44	81
8008	10	13	66¼	10	9	73	15	14	10·1	9½	44·8	80½
8012	9	13	66	10	8½	72·4	14	12½	8·5	9½	44·6	76½
8018	10	13	66¼	10	8½	72·5	12	12½	8·7	7½	42·6	73½

RESULT OF EXAMINATION OF THE WHEATS IN CLASSES WHICH WERE NOT SUBMITTED TO A MILLING TEST.

Catalogue No.	Variety.	Weight per bushel.		Appearance of Grain.	Trueness to Type	Uniformity of Grain.	Total.	
	—	Points Awarded.	Actual Weight.	—	—	—	—	
	Maximum Points.	15		10	10	10	45	
Class 1257 (Collection of Five Farrer Wheats).								
7973	Bena	10½	63½	8	8	8	34½	
	Canberra	13	66¼	8	10	10	41	
	Clarendon	12	65¼	10	10	10	42	
	Florence	12	65	9	9	9	39	
	Hard Federation ...	13	66¼	9	10	10	42	
								198½
7974	Bobs	14	67¼	8	9	9	40	
	Canberra	13½	66½	9	10	10	42½	
	Cedar...	14	67	9	10	10	43	
	Comeback	14	67¼	8	9	9	40	
	Federation	12½	65¾	10	10	10	42½	
								208
Class 1258 (Collection of Five Non-Farrer Wheats).								
7975	Billy Hughes ...	13½	66¾	8	10	10	41½	
	Gresley	12	65	9	10	9	40	
	Hariet	13	66	10	10	10	43	
	Petatz Surprise ...	15	68	10	10	10	45	
	Waratah	12	65¼	10	10	10	42	
								211½
7976	Carrabin	12	65¼	10	10	10	42	
	Gresley	13	66½	10	10	10	43	
	Marshall's No. 3 ...	12	65	9	9	9	39	
	Pusa 107	13½	66¾	9	10	10	42½	
	Waratah	12	65	10	10	10	42	
								208½

AWARDS.

Class 1245— [illegible] Strong Reds.	First Prize, No. 7907—S. Pollock; Cedar; grown at Glengarry, Quirindi, on red soil; seed per acre, 45 lb.; yield per acre, 21 bushels; rainfall during growth, 11·37 inches; autumn ploughing. Second Prize, No. 7906—D. and J. Gagie; Cedar; grown at West Wyalong on clay; seed per acre, 60 lb.; yield per acre, 17 bushels; fallow.
Class 1246— Strong White.	First Prize, No. 7909—J. W. Eade; Pusa No. 4; grown at Euchareena, on chocolate soil; seed per acre, 45 lb.; yield per acre, 25 bushels; fallow. Second Prize, No. 7910—D. and J. Gagie; Comeback; grown at West Wyalong, on clay; seed per acre, 60 lb.; yield per acre, 20 bushels; fallow.
Class 1247— Medium Strong.	First Prize, No. 7922—D. and J. Gagie; Carrabin; grown at West Wyalong, on clay; seed per acre, 50 lb.; yield per acre, 24 bushels; fallow. Second Prize, No. 7925—Mailer Bros.; Canberra; grown at Trundle, on heavy loam; seed per acre, 50 lb.; yield per acre, 40 bushels; rainfall during growth, 12·5 inches.
Class 1248— Special, Florence.	First Prize, No. 7930—D. and J. Gagie; Florence; grown at West Wyalong, on clay; seed per acre, 60 lb.; yield per acre, 21 bushels; fallow. Second Prize, No. 7929—Mrs. J. Berney; Florence, grown at Eurimbla, on red loam; seed per acre, 65 lb.; yield per acre, 22 bushels; rainfall during growth, 10 inches; fallow.
Class 1249— Special, Canberra.	First Prize, No. 7935—S. Plowman; grown at Parkes, on red clay; seed per acre, 45 lb.; yield per acre, 32½ bushels; rainfall during growth, 11·03 inches; fallow. Second Prize, No. 7934—Mailer Bros.; grown at Trundle, on heavy loam; seed per acre 50 lb.; yield per acre, 40 bushels; rainfall during growth, 12·5 inches; fallow.
Class 1250— Special, Waratah.	First Prize, No. 7943—F. E. Kentish; grown at Finley, on red loam; seed per acre, 50 lb.; yield per acre, 30 bushels; rainfall during growth, 10·13 inches; fallow. Second Prize, No. 7946—C. W. Weis; grown at Dunedoo, on red soil; seed per acre, 60 lb.; yield per acre, 45 bushels; autumn ploughing.
Class 1251— Special, Turvey.	First Prize, No. 7948—T. E. Gorman; grown at Yerong Creek, on red soil, sandy loam, and clay subsoil; seed per acre, 75 lb.; yield per acre, 27 bushels; rainfall during growth 12 inches; fallow.
Class 1252— Special, Bena.	First Prize, No. 7954—R. A. Studd; grown at Boggabri, on strong loam, with clay subsoil; seed per acre, 45 lb; yield per acre, 25 bushels; autumn. Second Prize, No. 7953—S. Pollock; grown at Glengarry, Quirindi, on red soil; seed per acre, 45 lb.; yield per acre, 33 bushels; rainfall during growth, 11·37 inches; autumn ploughing.
Class 1253— Special, Federation. (Novice).	First Prize, No. 7955—Miss E. W. Allnutt; grown at Treganthe, on black soil; seed per acre, 45 lb.; yield per acre, 28 bushels; rainfall during growth, 11·37 inches; autumn ploughing. Second Prize, No. 7956—J. Mactier; grown at Caniambo, Victoria, on heavy loam; seed per acre, 80 lb.; yield per acre, 15 bushels; rainfall during growth, 9 inches; fallow.
Class 1254— Special, Federation (Open).	First prize, No. 7959—S. Pollock; grown at Glen Garry. Quirindi, on sandy loam; seed per acre, 45 lb.; yield per acre, 46 bushels; rainfall during growth, 11·37 inches; autumn ploughing. Second Prize, No. 7958—R. Mactier and Sons; grown at Tatura, Victoria, on red loam; seed per acre, 90 lb.; yield per acre, 20 bushels; rainfall during growth, 8·63 inches; fallow.

Awards—*continued.*

Class 1255—Special, Hard Federation.

First Prize, No. 7961—C. K. Bragg; grown at Mungeribar, on light red soil; seed per acre, 45 lb; yield per acre, 45 bushels; rainfall during growth, 5·31 inches; fallow.

Second Prize, No. 7962—A. G. Pankhurst; grown at Tamworth, on stony soil; seed per acre, 50 lb.; yield per acre, 24 bushels; rainfall during growth, 6·1 inch; fallow.

Class 1256—Weak Flour.

First Prize, No. 7971—C. W. Weis; Waratah; grown at Dunedoo, on red soil; seed per acre, 60 lb.; yield per acre, 45 bushels; autumn ploughing.

Second Prize, No. 7963—Mrs. J. Berney; Petatz Surprise; grown at Eurimbla, on red soil; seed per acre, 60 lb.; yield per acre, 20 bushels; rainfall during growth, 9·5 inches; fallow.

Class 1257—Collection of Five Farrer Wheats.

First Prize, No. 7974—S. Pollock; grown at Quirindi; Bobs and Canberra on black soil; Cedar and Comeback on red soil; Federation on sandy loam; seed per acre, 45 lb.; yield per acre—Bobs, 18 bushels; Canberra, 24 bushels; Cedar and Comeback, 21 bushels; Federation, 36 bushels; rainfall during growth, 11·37 inches; autumn ploughing.

Second Prize, No. 7973—Mrs. J. Berney; grown at Eurimbla; Bena, Clarendon, Florence and Hard Federation on red loam; Canberra, on light loam; seed per acre—Bena, Florence and Hard Federation, 60 lb.; Canberra, 70 lb.; Clarendon, 65 lb.; yield per acre—Bena, 20 bushels; Canberra, 22 bushels; Clarendon, 21 bushels; Florence, 25 bushels; Hard Federation, 23 bushels; rainfall during growth—Bena, 9 inches; Canberra, 8 inches; Clarendon and Hard Federation, 9·5 inches; Florence, 10 inches; fallow.

Class 1258—Collection of Five Non-Farrer.

First Prize, No. 7975—Mrs. J. Berney; grown at Eurimbla; Billy Hughes and Waratah on red loam; Gresley, Hariet, Petatz Surprise, on light loam; seed per acre—Billy Hughes, Hariet, and Petatz Surprise, 60 lb.; Gresley, 56 lb.; Waratah, 70 lb.; yield per acre—Billy Hughes, 24 bushels; Gresley, 19 bushels; Hariet, 21 bushels; Petatz Surprise, 20 bushels; Waratah, 22 bushels; rainfall during growth—Billy Hughes and Gresley, 9·3 inches; Hariet and Petatz Surprise, 9 inches; Waratah, 8 inches; fallow.

Second Prize, No. 7976—S. Pollock, Quirindi; Carrabin on sandy soil; Gresley and Waratah on red soil; Marshall's No. 3, on sandy loam; Pusa 107 on black soil; seed per acre, 45 lb.; yield per acre—Carrabin, 16 bushels; Gresley, 30 bushels; Marshall's No. 3, 32 bushels; Pusa 107, 18 bushels; Waratah, 31 bushels; rainfall during growth, 11·37 inches; autumn ploughing.

Class 1259—Special, Strong White.

First Prize, No. 7977—J. W. Eade; Comeback; grown at Euchareena, on chocolate soil; seed per acre, 45 lb.; yield per acre, 25 bushels; fallow.

Second Prize, No. 7980—J. T. Watts; Quality; grown at Gobondery, on chocolate loam; seed per acre, 40 lb.; yield per acre, 30 bushels; rainfall during growth, 9·5 inches; fallow.

Class 1260—Special, Medium Strong.

First Prize, No. 7996—R. A. Studd; Early Bird, grown at Boggabri, on strong loam with clay subsoil; seed per acre, 45 lb.; yield per acre, 24 bushels; rainfall during growth, 5·37 inches; autumn ploughing.

Second Prize, No. 7983—J. Cavanagh; Clarendon; grown at Curlewis, on chocolate loam; seed per acre, 38 lb.; yield per acre, 33 bushels; rainfall during growth, 5·68 inches; short summer fallow.

Class 1261—Special Weak Flour.

First Prize (divide), No. 8002—Clark Bros.; Waratah; grown at Barellan on chocolate loam; seed per acre, 70 lb.; yield per acre, 28 bushels; rainfall during growth, 6·63 inches; fallow; and No. 8005—K. Gault; Waratah; grown at Trundle on red clayey loam; seed per acre, 50 lb.; yield per acre, 30 bushels; rainfall during growth, 6·5 inches; fallow.

Some Remarks.

The variety Canberra was well represented, and it was a difficult task to separate the samples. In fact, they all looked so much alike that had it not been for the milling and flour testing it would have been impossible to do the exhibitors justice in making the awards.

The Canberra exhibited by S. Plowman, Parkes, was a wonderful sample. It yielded 75 per cent. of flour, which is exceptionally high. The colour of the flour was full of bloom, and quite equal to the best commercial article of to-day. At the same time it was rich in gluten, and had a high water absorption for this class of wheat.

The red wheats were not up to their usual high standard, and there was very little difference between the samples exhibited.

The strong white class contained a few very good samples. That of Pusa No. 4, exhibited by J. W. Eade, Euchareena, which took first prize with 89½ points, made an excellent exhibit of this consistently high quality wheat. The flour produced was of excellent colour and rich in gluten, and it had a high water absorption; in fact, it was the highest in this respect of any of the wheats tested. The second prize was secured by D. and J. Gagie, Wyalong, with a sample of Comeback, which gained 86 points. The flour produced from this variety, while of excellent quality, was not quite up to Pusa No. 4, losing points on both colour and water-absorption.

Indian Pusa and the sample 4.P. were both worthy of note and are likely to secure prizes at future shows. The 4.P. variety was an excellent millers' wheat; it yielded over 75 per cent. of high quality flour.

The medium strong flour class was very well represented, and contained a big range of varieties. A very attractive sample of Carrabin, a new variety, exhibited by D. and J. Gagie, Wyalong, secured first prize. It was an excellent millers' wheat, yielding a large percentage of flour. It was rich in gluten, and had a high water-absorption. The second prize had to be divided between two exhibits of Canberra, one entered by Miss E. Allnutt, Quirindi, and the other by Mailer Bros., Trundle.

The Waratah class was well filled with a fine lot of wheat, and provided a very close contest between F. E. Kentish, Finley, and C. W. Weis, Dunedoo, there being only half a point between them. The former secured 80½ points, while the latter got 80 points out of 100.

The weak flour class provided a satisfactory entry. The first prize was easily secured with a sample of Waratah exhibited by C. W. Weis, with a total of 85 points, while the second prize went to Mrs. J. Berney with a sample of Petatz Surprise, which secured 80½ points.

The medium and weak flour "specials" for participants in the Field Wheat Competitions brought very large entries, as was to be expected. The first prize in the medium strong flour special was secured by R. A. Studd, Boggabri, with a sample of Early Bird. This is a very attractive looking wheat, after the type of Florence in appearance, and a splendid milling wheat, yielding a high percentage of flour, rich in colour and gluten-content, while the water absorption is satisfactory.

The second prize went to J. Cavanagh, Curlewis, with Clarendon, another very good milling wheat. Over 75 per cent. of flour was obtained from both these prize wheats, and there was a difference of only half a point between them in the total points awarded. The flour from Clarendon is rich in gluten, while the colour is excellent.

In the weak flour special, Waratah secured the prizes, that variety predominating with over a dozen entries. Waratah is a good milling wheat, yielding flour readily, which is of excellent colour, rich in gluten and water-absorption satisfactory. The first prize was divided between Clark Bros., Barellan, and K. Gault, Trundle, each obtaining 81 points. while the second prize went to H. Green, Forbes.

I wish to express my thanks to Mr. R. M. Petrie, of the Chemists' Branch, who helped me materially to expedite the work.

Queen Bees and Nuclei Colonies.

The Department is in a position to supply queen bees and nuclei colonies for the coming season from Hawkesbury Agricultural College and Wauchope Government Apiary. Inquiries should be addressed to the Under-Secretary Department of Agriculture, Sydney.

Superphosphate for Top-dressing.

READILY SOLUBLE BUT RETAINED BY THE SOIL.

THE dominant need of the soils of New South Wales—the soils of the pastoral districts at any rate—is phosphoric acid, and every fleece, carcase, or gallon of milk sold off the farm depletes still further the phosphoric acid content of the soil. That point has been demonstrated by the scientific worker, and the practical grazier concedes it by admitting that a phosphatic fertiliser gives the best results for top-dressing pastures. While the superiority of a fertiliser supplying phosphoric acid is generally admitted, the point has often been raised—most recently by the Graziers' Association of New South Wales—whether superphosphate, because of its ready solubility, is the most economical form in which to supply phosphoric acid to the soil.

It has been suggested by those who are of opinion that superphosphate is too soluble and that crushed phosphatic rock is too insoluble, that perhaps a fertiliser could be manufactured that would be midway between these two forms as regards solubility. It was even asked whether it would not be possible to obtain the desired result by treating rock phosphate with a smaller amount of sulphuric acid than would be required to convert the whole of the phosphate into a water soluble form. The Chief Chemist's reply was that such a procedure would most probably result in obtaining a product of a more or less sticky consistency which would not dry, and would therefore be difficult to handle, transport, and distribute. Moreover, the same mixture can be better obtained by mixing superphosphate with ground rock phosphate. The experience of the Department, however, has not indicated that the use of such a mixture for top-dressing pastures is as satisfactory or as economical as is superphosphate. The application of superphosphate has in the majority of cases given most beneficial results, though in a few cases—at Kiama, Jamberoo, and Orange—it has been found that the application of basic superphosphate, which is a mixture of ordinary superphosphate and lime, has given slightly better results than superphosphate alone.

WHY EARLY TOMATO FLOWERS DROP.

WHY the earlier bunches of flowers on tomato plants should drop off puzzled a grower who, in a recent letter to the Department, stated that he used poultry manure in connection with the crop.

The Agricultural Instructor who specialises in vegetable culture commented that the dropping of the flowers was probably due to excess nitrogen caused by the supply of poultry manure. The use of superphosphate or bonedust before planting is recommended, and manures containing nitrogen should be applied after the fruit is set. Low temperatures or excess of water at flowering time may both result in flowers not setting. Fertilisation of the early flowers could be aided by the use of a camel's hair brush, though the method was tedious.

Seed Maize Contests.

THE CENTRAL COAST, SEASON 1926–27.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

ALTHOUGH one of the driest springs on record was experienced, the season was remarkable for the number of records established in the maize-yielding contests conducted by the Macleay and Manning Agricultural Societies and the Mount George Agricultural Bureau. It may not be out of place to mention that, for high average yields, for output of pure seed maize, and for maize of very high quality, judged on Royal Show standard, the maize-growing districts of which Kempsey and Taree are centres are second to none in the Commonwealth. That this is so is in no small measure due to the influence of the maize-yielding contests conducted annually in these districts, and to general progressiveness on the part of the local agricultural societies, which place before growers up-to-date maize schedules, embracing the chief commercial named varieties grown and suitable for the district. In this respect, the Macleay, Manning, and Upper Manning stand alone.

The Entries.

This was the sixth annual contest for main varieties on the Macleay. Owing largely to the fact that the local agricultural society was presenting cups for competition, the entries reached a record of thirty-five, really too many to handle conveniently, for a large amount of work is necessary in the various sowing and harvesting operations. It is quite possible the limits will be fixed at about twenty-five for future contests, as on the Manning. The majority of the entries were local, although there was a fair representation from districts further south. The samples were surprisingly good, only about four or five being a little below standard. The difference in the high quality of seed sent for sowing nowadays, compared with the poor quality sent to earlier contests, has been freely commented upon by the maize growers who closely follow the competitions. There were ten Fitzroy entries, five Yellow Hogan, five Golden Beauty, four Leaming, and two Pride of Hawkesbury, and these comprised the main entries. Fitzroy is now grown extensively on the river, probably more so than either Yellow Hogan or Leaming—two very popular varieties of a few years back.

This was the seventh annual contest on the Manning, twenty-four entries being received, all but two of which were from local growers. The samples sent for sowing were well up to the highest standard usually selected by Manning growers. In a few instances a little variation from the recognised type was noticeable. For instance, Messrs. Flett's and McDonald's Fitzroys No. 2 were crossed types, being rough dented, coarse and deep grained, and both had distinct Pride of Hawkesbury features. Then again,

Messrs. Murray's and Mooney's Fitzroys No. 2 were different from the real Fitzroy type (represented in their No. 1). Although quite pure, they were selected with a purpose. The advice given some time ago, that the competition plots should be used as a "trying-out ground" for some definite object aiming at improvement in yield, was evidently being availed of by these farmers.

It is remarkable that of the twenty-four entries, twenty-one were of the three main yielding varieties, viz., Fitzroy (twelve), Pride of Hawkesbury (five), and Large Red Hogan (four). The competitions have at any rate shown the Manning growers which are the heaviest yielding varieties.

In the Mount George Agricultural Bureau contest (the third) there were twenty-five entries including a few early varieties entered by the Department as an early variety trial. These were omitted from the plot average. Entries of Fitzroy predominated, whilst Leaming, Golden Beauty, Manning Pride (varieties which always do well in the district), and Pride of Hawkesbury were well represented. The samples sent for sowing were the best yet received.

THE MACLEAY PLOTS.

In addition to Mr. E. H. Ducat, Timagog, and Mr. C. Ainsworth, Hampden Hall, who again came forward with plots, Mr. F. Waters also entered the contest on the Macleay. The early part of the season was one of the driest on record, only 103 points being recorded at Kempsey during the months of September, October, and November. Dry, hot winds during the latter six weeks helped to make the early season most unfavourable. After the break of the drought in December, however, a wonderful transformation took place, and the crops finished their season under favourable conditions. Were it not for the fact that good moist seed beds had been prepared, which stuck to the crops, the results could have been most disastrous. A word might be said here of the wonderful drought-resisting powers of the maize plant during that period of growth leading up to the tasselling stage, and of its remarkable recuperative powers when again favoured by rain.

RAINFALL at Kempsey.

1926.	Points.	1927.	Points.
September	64	January	1,008
October	34	February	325
November	5	March	325
December	656	Total	2,417

Hampden Hall Plot.—Mr. Ainsworth selected land on a low level farm, and adjoining that on which last year's plot had been sown. The soil was a loose sandy loam, drying out on the surface in protracted droughty spells, but evidently having a good moisture-holding under-strata of soil. After the removal of the stalks from the 1925-26 crop the land was ploughed in August and harrowed, and seed was sown on 9th September. While it is admitted that this type of soil works easily into condition, it is believed an earlier or an additional ploughing would have been beneficial. Germination was good, there being a big percentage of fours. Early growth was

checked, and during November the plants withered during the hot days, but they recovered wonderfully after the December rains. The remainder of the season continued favourable and a really good crop was harvested. Due to the autumn rains not being excessive, there were no fungous diseases present, and the crop was one of the cleanest harvested. Although the district was visited by a plague of cutworms earlier in the season, only one end of Mr. Ainsworth's plot was affected, and it was still possible to harvest an area untouched in this portion of the field, and to work out the yields of the varieties there proportionately.

Mr. F. Waters' Plot.—This was a successful experiment. Although similar methods are practised on low country of the Macleay, the idea might appear "rough" and against sound agricultural theory. The site selected was of low-lying swampy formation, soil 18 inches deep, rich and crumbly, and overlying a heavy clayey type of subsoil. The paddock was under a densely matted paspalum pasture. A ploughing 5 or 6 inches deep was given with the single mouldboard in June, the sod being broken up into small sections by repeated discings. So rough and turfy (dead) was the surface layers that it was only with difficulty that the shallow furrow necessary for dropping the grain in could be made. The seed was dropped on the apparently unbroken bottom of the furrows and covered by hoe with the sparse soil available. Still, the surface mulch helped the soil to retain its moisture well, and a fairly good germination took place. Considerable hand cultivation was given to the young growing crop, and growth continued fairly good during the early stages, although somewhat uneven and checked by the dry spring. However, after the December rains better growth could not be desired—the field turning out a very fine average yield. Cutworms and grubs did little damage.

Mr. E. A. Ducat's Plot.—A very rich portion of soil was well prepared on this farm for sowing on 8th September. Germination was good, but so much damage was done by cutworms that it was found necessary to cancel the plot. This was regrettable, as a very keen but friendly rivalry existed between the plot growers.

The Yields.—First place at East Kempsey was filled by Manning Pride (entered by Mr. Alex. Andrews, of Mount George), a variety rather extensively grown on the Upper Manning. It has a long cob and a deep wide yellow grain. Its yield of 137 bushels 34 lb. is the highest yet recorded on the Macleay in the competitions. Four of the next six places were filled by Fitzroy, all yielding above the 120-bushel mark. The plot average was 109 bushels 3 lb., a figure that fell just below the record of 1923-24; the honours are still with the 1926-27 plots, however, for it consisted of thirty-six varieties, compared with twenty-four in the earlier trial.

Compared with the East Kempsey plot, the greatest reversal in the Hampden Hall plot in performance took place amongst the Fitzroys, all excepting two entries showing substantial decreases. Why this was so would be difficult to say, for a similar happening took place last year.

Manning Pride (two), and Golden Beauty entries also fell away here. Probably the different effect the droughty conditions had on the lighter soil accounted for the apparent inconsistency of some of the varieties. It is known that some varieties stand up to adverse conditions better, and yield far more satisfactorily on certain classes of soils than other varieties; thus the choosing of two (in fact, three) classes of soil for the plots is a thorough try-out for the variety that gains first place. Leading position fell to Mr. Alex. Andrews' Fitzroy, with 123 bushels 42 lb., followed by Golden Beauty, and three other entries from the Upper Macleay, with yields ranging between 112 and 119 bushels.

TABLE of Yields—Macleay Competition.

Competitor.	Variety.	C. Ainsworth, Hampden Hall.		F. Waters, East Kempsey.		Average yield of two Plots.	
		bus.	lb.	bus.	lb.	bus.	lb.
Colin Smith	Yellow Hogan ...	117	37½	120	45	119	13
A. Andrews, Manning River...	Manning Pride ...	100	26½	137	34	119	2
S. Flett, Manning River ...	Pride of Hawk'sb'y	110	11	126	43½	118	27
V. Wright	Fitzroy	110	11	126	39	118	25
F. W. Hill, Wyong	Fitzroy	107	30½	128	44	118	9
A. Andrews, Manning River...	Fitzroy	123	42	111	54	117	48
R. Booth	Golden Beauty ...	119	18½	115	28	117	23
S. Flett, Manning River ...	Fitzroy	100	51	131	47½	116	21
F. Waters	Fitzroy	106	48	124	43½	115	45
E. H. Ducat	Yellow Hogan ...	112	14½	115	22½	113	41
R. Richardson, Manning River.	Golden Beauty ...	108	24	118	44½	113	34
J. G. Stitt, Manning River ...	Pride of Hawk'sb'y	108	9	116	21½	112	15
C. Ainsworth	Fitzroy	105	10	115	6½	110	8
C. Smith	Leaming	111	54	107	38½	109	46
J. W. Booth	Yellow Hogan ...	115	44	103	40	109	42
J. G. Stitt, Manning River ...	Large Red Hogan	108	16	108	24	108	20
J. P. Mooney, Manning River	Fitzroy	108	16½	106	28½	107	22
J. A. Jeffery	Hawkesbury Hogan	105	2½	106	36½	105	47
G. Levick, Manning River ...	Large Red Hogan	92	29	118	25	105	27
E. H. Ducat	Large Red Hogan	104	43	106	4	105	23
J. W. Booth	Large Red Hogan	104	43	106	4	105	23
C. Cross, Manning River ...	Golden Beauty X	101	45	106	11	104	0
J. G. Ward	Golden Beauty ...	100	41	104	25	102	33
J. G. Ward	Giant White ...	112	14½	91	43½	102	1
W. M. McMahon	Hawkesbury Hogan	102	21½	99	49½	101	7
D. Dornan	Yellow Hogan ...	98	6½	103	30	100	41
W. G. Ward	Manning Silver-mine.	108	9	91	35½	99	50
A. E. Booth	Hawkesbury Hogan	102	54	96	27½	99	40
E. H. Ducat	Fitzroy	97	13	100	26½	98	47
A. Andrews, Manning River	Leaming	88	5½	109	1	98	31
J. G. Stitt, Manning River ...	Golden Beauty ...	93	47	101	45	97	46
E. Dornan	Yellow Hogan ...	101	20	87	28½	94	24
W. M. Macdonald, Manning River.	Large Red Hogan	84	39	101	20	93	1
H. Booth	Hawkesbury Hogan	94	15	90	0	92	7
W. J. Seargent	"Fredericton Wonder," yellow	88	13	94	49	91	31
W. J. Seargent	"Seargent's Surprise," red ...	83	13	81	4½	82	8

The average plot yields were: F. Waters, 109 bus. 3 lb. per acre; C. Ainsworth, 104 bus. 22 lb. per acre. The cup winners were Messrs. Colin Smith and F. Waters.

The plot average was 104 bushels, or 5 bushels below the East Kempsey plot, though the Hampden Hall plot was more even throughout.

The winning entry over the two plots was Mr. Colin Smith's Yellow Hogan, a well known variety on the river, which yielded consistently throughout. This is the third win for this variety in the contests.

Mr. Smith's success was well deserved, as he has been an enthusiastic supporter of the competitions for a number of years, and his name figures prominently as a winner on the Macleay show boards annually. It was unfortunate for Mr. Andrews that after leading on both plots with different varieties he had to be contented with second place. Mr. Flett's Pride of Hawkesbury, which won the Manning 1924-25 contest, and came second in the present season's contest on the same river, also yielded well, filling third place. Without wishing to belittle the very fine performance of Yellow Hogan, the consistency of Fitzroy in filling five of the first ten places—taken in conjunction with its success on the Manning—undoubtedly places it as the leading variety on the Central Coast.

The highest average yield of 119 bushels 13 lb. by Mr. Smith's Yellow Hogan, is a record exceeding the previous best by 3 bushels. Seven other entries exceeded the former record. Twenty-six of the thirty-six entries topped the 100-bushel mark—a fine performance considering the season.

THE GOLDEN SUPERB CONTEST.

In this contest (the fifth) there were also record entries, twenty-six competing, or nearly 100 per cent. more than the previous record. The majority of the samples were good, two or three only being below the mark. It was noticeable that a number of types were lighter in colour than hitherto. Some entries, too, were uneven in shape and colour, but this was only to be expected where a number of "new" competitors were making their initial entry.

Since the Macleay Agricultural Society have made cups available for the contest also two plots are being sown instead of one. The first sowing was made at Timagog on Mr. Ducat's farm, on a sandy loamy soil. Unfortunately, no sooner had the plants appeared than they were destroyed by cutworms. Mr. V. Wright, on whose farm at East Kempsey the second plot was sown, was more successful.

The portion of land here had grown maize for many years previously, and was regarded by many as "worked out," but by putting sound cultural practices into operation Mr. Wright was able to harvest good crops. The seed-bed was in good order—the early preparation consisting of an early ploughing, an additional ploughing, and several discings. Germination was good, but ten weeks of unfavourable weather followed—an entire absence of rain, and much wind and heat. The crop looked well although making little headway, but after the December rains it made fairly good recovery. Early varieties as a rule do not "wait" for rain, as do the late maturing sorts. Usually the tassels appear in the natural order of events, and although this did happen here and there, the rain came just in time.

This is the first occasion during the course of these contests on which a dead heat resulted for first place, the strains entered by Messrs. V. Wright and F. Waters, neighbouring farmers, both returning a yield of 91 bushels 8 lb. Of the first twelve places, fully 50 per cent. of the entries were of seed originally produced by Mr. W. H. MacMahon, Pola Creek, a grower in a large way of Golden Superb. His strain matures about a week later than the earlier types in the competition, Messrs. C. Ward's and E. H. Ducat's. The best samples harvested were in the following order:—C. Ward, A. Jeffery, E. Dornan, D. Duncan, V. Wright, F. and P. Waters, J. Skimmings, Foster, McMahon; there being very little difference.

The average plot yield, 78 bushels 48 lb., was considerably lower than the record. At one stage it was quite expected that the plot would have to be abandoned.

YIELDS on Mr. V. Wright's Plots.

	bus.	lb.		bus.	lb.
V. Wright	91	8	C. Ward	77	44
F. Waters	91	8	Colin Smith	77	44
P. Waters	88	0	W. J. Seargent	77	0
D. Duncan	87	12	J. Skimmings	75	24
A. Skimmings	86	24	W. J. Seargent (No. 2) ...	75	24
E. W. Foster	86	24	W. F. O'Dell	74	36
A. Jeffery	86	24	E. E. Booth	72	16
A. E. Booth	84	4	C. Ainsworth	72	16
W. H. MacMahon	83	16	E. H. Ducat (No. 1) ...	71	28
F. J. Cooper	82	28	J. W. Booth	69	52
E. Dornan	81	40	J. H. Jeffery	66	0
E. H. Ducat (No. 2) ...	81	40	V. Keshy	66	0
Geo. Skimmings	80	8	R. Keshy	64	24

THE MANNING PLOTS.

Three plots were selected for the contest—Mr. R. Richardson, Mondrook last year's winner), Mr. J. Cameron, Dumaresq Island, and Mr. Alan Murray, Kolodong. The last two were new competitors.

Where moisture had not already been conserved by early autumn ploughing there was little chance of doing so with the dry conditions ruling in July and August. September was also cold and dry, and October and November were hot, dry, and windy. It is doubtful whether such another dry spring has been experienced on the Manning; between 31st August and 1st December only 104 points of rain were registered. The drought broke early in December, which helped the plots to make a wonderful recovery. For the remainder of the season rain fell in just sufficient quantities to ensure excellent crops. It was an ideal season for the late maturing varieties which weathered the dry early season, and then had just the conditions to suit them—little wonder they filled all the leading positions.

RAINFALL at Taree.

1926.	Points.	1927.	Points.
September	53	January	460
October	44	February	129
November	7	March	389
December	978	Total	2,060

Mr. Richardson's Plot.—Benefiting by previous experience, the land was again ploughed early, being deeply disced immediately after the removal of the previous crop early in April. All stalks, &c., were turned in. The plot was left in fallow until June, when it was ploughed with the mould-board at a lesser depth than the first time, and then harrowed. Prior to sowing on 9th September the land was harrowed, twice disced, and at the same time a dressing of 1½ cwt. superphosphate per acre was worked into the soil. The seed-bed was excellent and germination was good. The crop, although checked, looked well, and made fair progress through the dry spell, in marked contrast to other crops adjoining on land that had not been so well prepared. A topdressing of nitrate of soda, 1 cwt. per acre, was sprinkled up the rows during the early stages of growth. Although cut-worms caused no end of trouble in neighbouring crops, the competition plot was remarkably free, due possibly to the extra working of the soil having destroyed eggs, larvae, &c.

Mr. Cameron's Plot.—A rich heavy loamy soil was selected for the plot. Previously the land had grown maize, potatoes, sorghum, and fodder at various times. The first ploughing was given in July, and the land was left a month or so to fallow. Another ploughing, followed by a harrowing or two and a rolling, took place in September. The plot was sown on 16th September, a dressing of a bag of superphosphate to the acre being dropped in the drills prior to seeding. Germination was good. During the dry spell growth was uneven, and cutworms did some damage on the northern end. After the December rains rapid growth took place, and the crop, besides "evening up," grew to an average height of 12 feet.

Mr. Murray's Plot.—Originally it was intended to sow this plot in September also, but owing to the soil being on the dry side it was decided to wait for rain. This did not come until December, and the plot was not sown until the 24th of that month—really too late. Germination was good, and, helped by the favourable conditions, the crop grew rapidly, ultimately reaching 13 or 14 feet high. During the Easter gales (when 20 inches of rain were registered in one week) the crop lodged badly, and had to be abandoned. On appearances it promised to yield equally as well as the others.

The Yields.—The highest yield at Mondrook, put up by Mr. Flett's Pride of Hawkesbury-Fitzroy cross, is the highest individual yield yet recorded in competition on the coast. Seven other entries, mostly Pride of Hawkesbury and Large Red Hogan, exceeded the 141-bushel mark—a remarkably good performance, considering the season. The lowest yield was 114 bushels. The average yield for the whole plot, 133 bushels 51 lb., far exceeds any previous average on the coast, where maize has been subjected to a moisture determination of 13 per cent. The excellent results may be attributed to a rich practically new soil, sound cultural methods aiming at the conservation of soil moisture, a good germination, judicious application of fertilisers, a favourable season for the late long season varieties, and last, but not least, seed of high yielding quality.

Although not quite up to the Mondrook standard, the Dumaresq Island plot was a very fine one. The first three places were filled by Pride of Hawkesbury. Less than 10 bushels separated the first sixteen entries; as in the Mondrook plot, all entries exceeded the 100-bushel mark.

TABLE of Yields—Manning Competition.

Competitor.	Variety.	R. Richardson, Mondrook.		J. Cameron's Dumaresq Island.		Average yield over two Plots.	
		bus	lb.	bus.	lb.	bus	lb.
Dempsey Brothers ...	Pride of Hawkesbury...	148	3	134	21	141	12
S. Flett	Fitzroy x Pride of Hawkesbury.	151	41	129	3	140	22
J. G. Stitt	Pride of Hawkesbury ...	144	45	134	12	139	28
Geo. Levick	Large Red Hogan ...	148	49	125	8	137	5
Len Stitt...	Large Red Hogan ...	148	28	124	43	136	35
J. G. Stitt	Large Red Hogan ...	146	0	124	3	135	1
S. Flett	Pride of Hawkesbury...	134	38	133	43	134	12
W. Macdonald	Pride of Hawk'sb'y No. 1	142	9	125	20	133	43
R. Richardson	Large Red Hogan ...	136	48	129	44	133	18
W. Macdonald	Pride of Hawk'sb'y No. 2	141	48	123	19	132	18
J. P. Mooney	Fitzroy No. 1	139	4	124	11	131	35
W. Macdonald	Pride of Hawk'sb'y No. 2	137	0	125	36	131	18
W. Murray	Fitzroy No. 1	128	1	130	54	129	28
W. Macdonald	Fitzroy No. 1	133	1	124	19	128	39
F. W. Hill	Fitzroy	128	1	124	43	126	22
A. W. Singleton... ...	Fitzroy	129	52	120	36	125	16
S. E. Etheringham ...	Fitzroy	121	30	127	49	124	39
J. P. Mooney	Fitzroy No. 2	118	0	128	1	123	0
J. Dorney	Fitzroy	131	14	106	21	118	45
Len Stitt...	Manning Pride ...	130	54	101	53	116	26
W. Murray	Fitzroy No. 2	124	19	108	16	116	17
S. E. Everingham ...	Manning Silvermine ...	123	17	102	40	113	0
D. Dorward	Fitzroy	114	16	105	43	110	1
R. Richardson	Golden Beauty ...	114	18	101	12	107	43

The cup winners were R. Richardson, 133 bus. 51 lb.; Dempsey Brothers, 121 bus. 14 lb.

Messrs. Dempsey Brothers, who have been prominent in the competitions for some years, thoroughly deserved the honours in gaining highest average over the two plots with Pride of Hawkesbury. Although a rough dented type compared with the correct standard for the variety, the grain was very deep, and the cobs of great length. Mr. S. Flett's type of the variety (which won last year) again finished close, filling second place, Mr. J. G. Stitt being third with the same variety. His is a very fine strain of the variety—the correct type—with which he repeatedly secures first place on the Royal Show boards. Large Red Hogan yielded well; the majority of the entries appeared a little short in the cob compared with previous years. Messrs. J. G. Stitt and S. Levick had the best types of the strain. The Fitzroys monopolised practically all the places between the ninth and nineteenth, and ranged between the 118- and 132-bushel marks; the longer maturing varieties were just a little superior on the season. Manning Pride, Manning Silvermine, and Golden Beauty varieties, maturing still earlier, finished lower on the list.

The average yield of Messrs. Dempsey Brothers' Pride of Hawkesbury, 141 bushels 12 lb. per acre, is nearly 10 bushels higher than the previous best, which was put up in the 1924-25 contest. No less than twelve entries in the present contest exceeded that yield, all but two being of the Pride of Hawkesbury and Large Red Hogan strains.

THE MOUNT GEORGE CONTEST.

This was the most successful contest yet held at Mount George. Mr. Colin Shields, on whose farm the plot was sown, had prepared a rich portion of alluvial soil by ploughing deeply with the disc plough in July. A month later the land was twice harrowed and ploughed again, and in September, just prior to sowing, a double discing and harrowing were given.

Pumpkins had grown on the land previously. Few crops leave the land in better condition than this vine. The dense growth shelters the land from the hot sun's rays during the summer months, helping the soil to retain its moisture, and the enormous root system keeps the soil in fine condition for ploughing.

MOUNT GEORGE Agricultural Bureau Plot Yields.

Competitor.	Variety.	Yield. bus.	Yield. lb.
C. Shields ...	Pride of Hawkesbury	127	24
C. Shields ...	Leaming	120	12
Alan Murray	Fitzroy (cross)	116	37
Department of Agriculture	Ulmarra Whitecap ...	114	8
A. H. Norris	Fitzroy	114	4
R. M. Gemison	Manning Pride	110	50
J. P. Mooney	Fitzroy	110	50
Alex. Andrews	Fitzroy	109	38
D. Cameron	Fitzroy	108	47
J. Dorney ...	Fitzroy	108	40
W. M. Macdonald	Pride of Hawkesbury	107	54
Alex. Andrews	Manning Pride	105	52
D. Cameron	Golden Nugget	103	48
Alex. Andrews	Leaming	102	46
F. Cross	Golden Beauty (1) ...	100	43
D. Dorward	Fitzroy	100	27
S. E. Everingham...	Manning Silvermine	99	42
F. Cross	Golden Beauty (2) ...	94	49
R. Richardson	Golden Beauty	94	41
Department of Agriculture	Leaming	92	37
G. E. Levick	Large Red Hogan ...	92	4
Department of Agriculture	Yellow Hogan	90	32

Average yield, 105 bus. 44 lb. per acre.

The plot was sown on 15th September. Germination was good, and, although they were prevalent, only a little damage was done by cutworms. During the dry spring months the crop looked fairly well, and made moderate growth. During November, however, the effects of the drought were more noticeable. After the December rains a good recovery was made,

The rainfall was about the same as that at Taree, which is given above, but the December falls were lighter.

The contest was won by Pride of Hawkesbury, with a yield of 127 bushels 24 lb. per acre. This variety has had a wonderful run of successes the past two seasons on the Lower North Coast.

Leaming, entered by the same grower, secured second place. It is a variety that has always yielded consistently on the Upper Manning. Fitzroy filled six out of the first ten places. The plot average of 105 bushels 44 lb. per acre is the best yet recorded.

The Australian Tobacco Investigation.

The organisation of the Australian Tobacco Investigation is briefly explained in a recent communication from the Executive of that body, the object being primarily to correct a false impression that exists as to the object of the funds provided for the investigation.

As the outcome of an offer made in August of last year by the British-Australian Tobacco Company, an agreement has been drawn up with the Commonwealth and the five mainland State Governments whereby the Company is to provide £20,000 over three years, the Commonwealth Government £5,000, and the State Governments together a further £5,000. If, at the end of that time, developments are sufficiently encouraging to warrant further effort, the Company will provide a further £30,000 conditionally on the Commonwealth and State Governments providing a similar amount between them.

There is an impression that the purpose of the funds made available under the agreement is to provide some form of subsidy or financial assistance to the industry. Such is not the case. The purpose of the Australian Tobacco Investigation, as its name implies, is to investigate the problems of the industry with a view to their solution, and so to establish the industry in Australia on a sound and stable basis.

It is the considered opinion of the Executive that, until the proper methods and conditions have been determined, an increase of the area at present devoted to tobacco is inadvisable. A rapid expansion of the industry at present would probably lead to much unsuitable land being devoted to tobacco culture, and to the production of much inferior leaf. Those desirous of obtaining information regarding the industry should communicate with their own State Department of Agriculture, which, in the future as in the past, will continue to be the medium for imparting practical advice to growers.

Varieties are sometimes of very local application, and a farmer may find that a wheat that does well with a neighbour, say, 3 miles away, may not suit his particular conditions. It will often pay a farmer to experiment for himself in parts where Departmental plots are not yet established.—J. T. Pridham, Plant Breeder.

Farmers' Experiment Plots.

MAIZE GREEN FODDER TRIALS, 1926–27.

South Coast.

R. N. MAKIN, Senior Agricultural Instructor.

AT the present time the growing of maize on the South Coast centres itself in the production of crops suitable for feeding to dairy cattle, either in a green and succulent state or as silage.

For many years experiments were conducted with varieties suitable for grain and also with those most suitable for green fodder. It was found that certain varieties in each class were suitable for the purposes mentioned, and they have been recommended by the Department accordingly. The next step in the experimental work was to endeavour to ascertain ways and means of increasing the yield per acre, and, as there was more inquiry from dairy farmers for green fodder crops, the work has been in that direction.

Quite a lot of work has been done with artificial fertilisers, and it has been found that from the point of view of economy, superphosphate alone was satisfactory. That having been demonstrated, the next move was to determine the quantity of superphosphate required to meet the needs of the crop. This work is perhaps the most difficult of the lot as so many factors have to be reckoned with. Variations in soil, rainfall, temperature and cultivation all play their part, and in order to get some reliable information on this point it has been necessary for the experiments to be continued over a number of years. The past season's work lay in this direction, but except for those from Kangaroo Valley, where rain coming at a critical time saved the crop, the returns are not good. The plots at Camden and Dapto failed altogether. The returns from the Milton plot are misleading as the section sown without manure gave the highest return. This has occurred previously in other districts, and is due to conditions which are frequently hard to trace—if the history of the cropping of the land is available it can generally be determined; if not, it is difficult to account for it because plots are sown on land selected as being uniform and typical of its class. Where farms have changed hands it is not easy to get the full history of the cropping.

The rainfall covering the period over which these experiments were grown was much below normal until April, when exceptionally heavy rain fell. The Albion Park plot was the only one that benefited by this rain.

Of the plots under review, that sown at Kangaroo Valley reflected the use of artificial fertilisers, especially as two varieties of maize were sown; the ground was uniform not having been under the plough for many years. It

will be noticed that the 18 per cent. superphosphate was included in these trials, but as it is now not on the market it will not be under trial again, the 22 per cent. quality being in the majority of cases more satisfactory. The difference between the manured and unmanured sections is very convincing.

Some interesting soil conditions were found on Colonel Murdoch's "Bendooley" property at Berrima. The soil in this particular paddock is a light basalt loam; while it will produce a good stand of pasture grasses, oat and maize crops have not been satisfactory. Of the factors which exercise their part, there is no doubt unfavourable weather conditions had much to do with the low yields. However, in the experiment with maize for green fodder a test was conducted in which superphosphate and gypsum combined were tried against superphosphate alone, basic superphosphate, and no fertiliser. Unfortunately the crop was cut somewhat on the dry side, early frosts having exercised their influence. The returns incline one to believe a greater quantity of gypsum would be beneficial.

GREEN Fodder Trial.

	A. Chittick, Kangaroo Valley.	G. MacIntyre, Albion Park.	Roy Garratt, Milton.
Sown	28 Oct., 1926	12 Jan., 1927	2 Nov., 1926
Harvested	12 Mar., 1927	8 June, 1927	4 April, 1927
Rainfall	677 points	Not available	667 points.
Seed per acre	30 lb.	30 lb.	30 lb.
Fitzroy.			
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Superphosphate, 18 per cent., 2 cwt. per acre	33 18 3 0	13 0 3 0	....
Superphosphate 22 per cent., 2 cwt.	33 12 0 0	14 2 3 0	....
No manure	17 4 2 0	12 7 2 0	....
Basic superphosphate, 2 cwt.	30 1 3 0	13 8 1 0	....
Pride of Hawkesbury.			
Superphosphate 18 per cent., 2 cwt.	30 1 1 0	14 15 0 0	17 18 3 0
Superphosphate 22 per cent., 2 cwt.	29 0 2 0	14 15 0 0	10 19 2 0
No manure	18 13 0 0	14 2 3 0	28 0 0 0
Basic superphosphate, 2 cwt.	29 12 3 0	17 6 2 0	24 0 0 0

A plot was also sown by Mr. J. W. Chick at Dapto but failed.

The gypsum and superphosphate trial conducted by Colonel Murdoch at Berrima was sown on 11th November, Fitzroy being the variety used. The rainfall was 21·24 inches and the harvesting on 3rd May gave the following results:—

	t.	c.	q.	lb.
Superphosphate 1½ cwt. and gypsum 3 cwt.	11	7	0	0
Superphosphate, 1½ cwt.	9	1	1	0
Superphosphate 1½ cwt. and gypsum 2 cwt.	7	4	0	0
Basic superphosphate 2 cwt.	7	4	0	0
No manure	5	2	0	0

A Record-producing Jersey.

Wagga Gladys Eclipses Australian Jersey Records.

J. A. ROBERTSON, M.R.C.V.S., Herd Master.*

Wagga Gladys (7,778), one of the high-producing cows in the Jersey herd at Hawkesbury Agricultural College, has just recently established a new Australian record for milk production, as well as an official Australian record for butter fat, by yielding nearly 15,951 lb. of milk in 273 days, which at 5·3 per cent. test represents 839·814 lb. butter fat. Her testing is being extended to a lactation period of 365 days, which will be completed during the month of October, so that interest in her present performance is not exhausted.

Wagga Gladys was bred at Wagga Experiment Farm, where she was dropped on 15th October, 1919, but later she was transferred to the College. Her sire was Goddington Noble XV (imp.) (948), and her dam Wagga Gladsome (3,988), by Xmas Fox (imp.) (947), from Fancy of Richmond (4,820), by Kaid of Khartoum (949).

She did not drop her first calf until she was three years and two months old, and, although it is generally held—probably correctly so—that if dairy cattle are to make high producers, they should be bred early—in Jerseys from two years to two years and three months—yet the delay has evidently not affected Wagga Gladys. On the other hand, calving so late may have assisted in fitting her to stand up to the strain of continued high production. She was certainly well-grown and robust when her first calf was dropped.

Wagga Gladys' Records.

On the first lactation period as a junior three-year-old she gave 7,906·5 lb. milk, of 5·66 per cent. test, or 435·026 lb. butter fat, being the equivalent of 524·12 lb. of commercial butter. This was on a 273-days' test, and continuing for the full test period of twelve months she produced 733·4 lb. butter.

On her next lactation period as a junior four-year-old, she produced in 273 days, 11,398·5 lb. milk, of 5·64 per cent. test, or 534·451 lb. butter fat, which is equal to 643·917 lb. commercial butter. Continuing the test for the full period of 365 days, she produced 1,009·65 lb. butter. During this lactation period Wagga Gladys was milked three times a day. On the other tests she was only milked twice daily.

As a five-year-old she produced 12,910·5 lb. milk, of 5·45 per cent. test, or 703·725 lb. butter fat, being the equivalent of 847·86 lb. commercial butter. For the full period of 365 days 1,082·68 lb. of butter were produced.

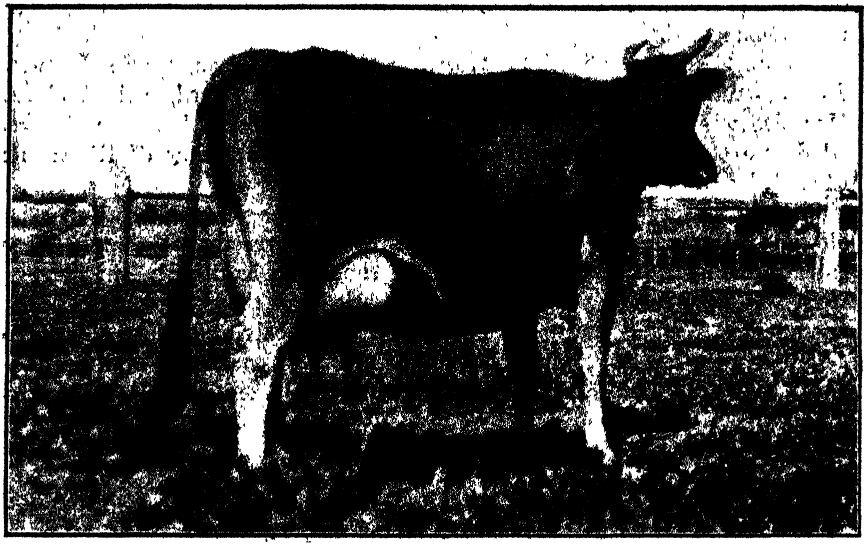
On her present lactation as a seven-year-old, which is still in progress, she has produced for the first nine-months period 15,951 lb. milk, of 5·3 per cent. test, 839·814 lb. butter fat, being equal to 1,011·8 lb. commercial butter.

* Mr. Robertson's death took place between the writing of this article and publication. See page 784.

Thus her average production for four consecutive periods of 273 days each, including her first calf, is 12,041·6 lb. milk, 628·254 lb. butter fat, or 756·924 lb. commercial butter. For four consecutive periods this can be accepted as an Australasian record.

A Line of High Producers.

Wagga Gladys is descended from a family of proved producers, her dam, Wagga Gladsome, producing 8,225 lb. milk, 374·51 lb. butter fat, equal to 451·219 lb. commercial butter in 273 days. She was then a nine-year-old, and continuing on for the full 365 days she produced 571·75 lb. butter. Wagga Gladsome was not tested until she was a mature cow.



Wagga Gladys (7778) of Hawkesbury Agricultural College Jersey Herd,
On her fourth lactation period she yielded 15,951 lb. milk, 839·8 lb. butter fat, establishing an Australian record.

Fancy of Richmond, the grand dam of Wagga Gladys, was also a heavy producer. As a mature cow she gave 8,073 lb. milk, 423·134 lb. butter fat, or the equivalent of 509·80 lb. commercial butter. This test was for a period of 273 days, but continuing for the full 365 days she yielded 636·33 lb. commercial butter.

Among high producing relatives might be mentioned Wagga Gloria and Wagga Joy, both full sisters to the champion. Wagga Gloria produced 6,139·5 lb. milk, 324·67 butter fat, equal to 391·16 lb. commercial butter in 273 days as a junior two-year old. Her production for the full period of 365 days was 532·45 lb. butter. Wagga Joy gave 7,644 lb. milk, 408·153 lb. butter fat, or 491·751 lb. commercial butter in 273 days as a junior three-year-old, and over the full period of 365 days she produced 631·39 lb. butter.

The following year this cow was affected with milk fever, but the year following that again—though her udder was still affected—she produced 634·92 lb. butter in 365 days.

A Well-performed Sire.

Goddington Noble XV (imp.), sire of Gladys Wagga, is also the sire of a number of other high-producing cows. Nineteen of his daughters averaged 8,739 lb. milk, or 566·19 lb. butter, in an average lactation period of 326 days.

Included in the nineteen is Wagga Ariadne, who produced over 1,000 lb. butter in two consecutive lactation periods, giving the highest yield as a

Goddington Noble XV. (imp.) (948) by Goddington Noble (10251 E.J.H.B.), out of La Francaise III (imp. from Jersey.
Sire of Wagga Gladys.

seven-year-old. At this age she produced 16,942·5 lb. milk, 899·99 lb. butter-fat, which is equal to 1,084·33 lb. butter in 365 days. In three consecutive years she averaged 966·95 lb. butter.

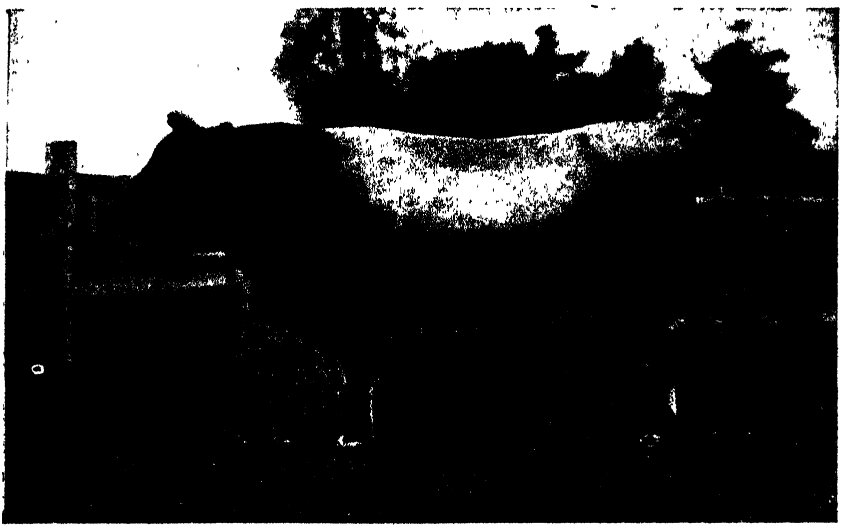
Another branch of the same family includes Wagga Bashful, a full sister to Fancy of Richmond. Wagga Bashful produced 11,115 lb. milk, 632·35 lb. butter-fat, equal to 761·74 lb. butter in 273 days, and continued for the full period of 365 days to produce 906·80 lb. butter. She was ten years old when this performance was recorded. In three consecutive lactation periods this cow averaged 806·07 lb. butter. Her daughter, Wagga Beauty (by Goddington Noble XV ex Wagga Bashful), produced 10,605 lb. milk, 574·806 lb. butter-fat, equal to 692·53 lb. butter in 273 days. Continuing for the full lactation period of 365 days, she produced 888·03 lb. butter. This was as a five-year-old.

How Wagga Gladys has been Fed.

On the hypothesis that feeding must be linked with breeding to secure high production, an indication of the ration fed to Wagga Gladys may be given.

Concentrates.—The following mixture was fed daily at the rate of 1 lb. to every 3½ lb. milk produced:—300 lb. maize meal, 200 lb. bran, 100 lb. crushed oats, 50 lb. linseed meal. During March and April the mixture was altered by the substitution of 25 lb. cottonseed meal for 25 lb. of the linseed meal.

Bulk Ration.—The daily bulk ration consisted of:—25 lb. maize silage, 10 lb. lucerne chaff (of poor quality during May), 3 lb. bran, and 1½ lb. linseed meal. During March and April half the linseed meal was replaced



Xmas Fox (imp.) by Silver Fox (10,097 E.H.B.), ex Malvoisie.
Sire of the dam of the champion Jersey cow Wagga Gladys.

by an equal amount of cottonseed meal. During the latter half of the month of March, the silage was replaced by an equal amount of green corn-stalks chaffed.

Grazing.—The pastures were very poor, except after the Easter rain. In December Wagga Gladys was grazed on a poor stand of green lucerne for two days prior to test. In January, she was grazed on green lucerne for two hours daily for a week previous to test. In February, March, and April she was grazed on green lucerne for two hours daily, and in May and June for one hour daily. In July green oats were given for a week previous to the test; Gladys and the whole herd went off in butter fat yield this month, and the green oats were blamed. In August, she was grazed on green lucerne for two hours daily.

Tractor Farming.

E. T. WALKER, Wattamondara.*

In dealing with the question of tractor farming, I will endeavour to give you as accurate an account as possible of our experience, extending over a period of nearly four years. Realising that the adoption of the system involves the outlay of a considerable sum of hard-earned money, let us deal first of all with the question, "Does it pay?"

In arriving at the cost of any particular class of work, per day or per acre, the most difficult matter is to estimate the depreciation, and in the figures I will give I have made this particularly high, so that the total cost may be written off in about five years. Then, if the machine has been cared for, its value will equal or exceed the amount that has been spent in repairs. With care, a tractor can no doubt be made to last ten, fifteen, or twenty years; but then the amount spent in repairs would exceed its value at the end of that time, so that while a smaller amount per acre may be written off as depreciation, a further amount would have to be added, under the heading "Wear and tear," to make up the deficiency, and the result would be just about the same.

We believe that the cost per acre with an ordinary kerosene tractor is about the same as with horses when horse feed is a medium price, and the following figures relative to two different classes of work are based on actual costs very carefully kept, as far as the tractor is concerned. First, take ploughing, say 5 inches deep, the cost per average day with tractor would be as follows:—

	£	s.	d.
Fuel, oil, and grease	2	0	0
Depreciation	1	10	0
Wages	1	0	0
Total	£4	10	0

The area ploughed would be 12 acres, at a cost of 7s. 6d. per acre.

With horses the approximate cost per day would be—

	£	s.	d.
Horse feed	1	15	0
Wages	0	15	0
Depreciation	0	5	0
Total	£2	5	0

The area ploughed would be about 6 acres; therefore the cost is about the same.

Cultivation with the combine or duck foot, 2 or 3 inches deep, is a class of work that we have learned to regard as of very great importance. The average daily area would in each instance be increased 250 per cent. above amount when ploughing, and would be 30 acres and 15 acres for tractor and horses respectively, and the cost, based on the above figures, would be about 3s. per acre.

* Paper read at the July meeting of the Wattamondara branch of the Agricultural Bureau.

So much for actual working costs. Now let me enumerate several ways in which we feel sure that a tractor has a decided advantage, both from the point of view of finance or of personal comfort. When work with a tractor is finished the expenses cease, but horses either have to be fed or a paddock reserved for them, whereas it might be put to profitable use in other ways. Take your minds back to the seeding time of 1926, when work was continually being held up by wet conditions. I venture to say that on most farms no work was done on half the days during April, May, and June. The horses would mostly be kept well fed, so as to be in strong condition for pushing on when conditions were favourable, and the cost in horse feed per acre would be nearly double what it would be in ordinary years. Again, in drought times, when feed values are increased perhaps 100 per cent., the result from the point of view of cost of working can easily be imagined.

Another advantage, which is to our minds by far the greatest of all, is what one writer has described as timeliness, or the possibility of either carrying out a given amount of work in the short space of time available, or when there is more time, the doing of that work while conditions are ideal and the result most satisfactory. I will give you the three most striking instances of this that we have had. During 1924 we fallowed two paddocks, each of 85 acres, and these were both worked and left in good order for the harvest time of that year. During December there was a smart shower, but only enough to delay stripping operations a day or two. By working continually from 2 p.m. one day till 9 p.m. the next, we completed the cultivating of one paddock, and the result was that this paddock retained a good mulch free from weeds throughout the midsummer months, while the other became compacted, dry, and coated with summer grass, &c., with the result that later it had to be disc-ploughed--an operation costing more than twice as much to perform, and the subsequent crop was not as good.

The second experience occurred towards the end of November, 1925, when there was a good fall of rain of about 2 inches. Now, the wheat was almost ripe, so what were we to do with the fallow? By working day and night for just about a week, we cultivated 350 acres. And now I come to the part I wish to make clear. To avoid shifting the plant in the darkness we left a few acres untouched in one paddock. This received an extra working in January, and in all other workings was treated the same as the rest; but at harvest time the difference in the crop could be seen half a mile away, and I feel sure amounted to at least three bags per acre.

The third instance relates to this year, 1927. A heavy thunderstorm in January was the only rain of much consequence during the first few months of the year. Without recourse to night working we were able to plough, while in an ideal condition, about 70 acres of stubble ground, and then to go over the whole of the fallow of 200 odd acres. The results have been self-evident, for when the oats were sown during the third week in March on the stubble ground they germinated well and maintained a very fair growth, so that early in May the sheep were turned on to a fairly dense body of feed about 6 inches high just at a time when green feed was very scarce indeed.

For these reasons alone we are confident that the tractor has paid for itself twice over in returns that we could not have obtained had we depended upon the horses.

I can best illustrate the idea of personal comfort by referring to this last seeding time, when, although rising each morning at an hour that would have been regarded as laziness a few years ago, and at the same time attending to various other jobs about the place, we were still able to complete each operation at a time best suited to the variety concerned, and to take advantage of the best conditions that the season offered.

Then again a tractor is especially suitable for belt work, being quickly moved from one class of work to another and easily placed in position, and also handy for haulage work, log-dragging, &c., at which it is equal to five or six horses pulling full strength.

Sometimes we hear of instances where a tractor has been a failure, and wonder what are the reasons. Perhaps it is that under the conditions obtaining on certain farms they are not suitable; but I feel sure that this is not always the case. During last year, as I have already mentioned, we experienced one of the wettest times on record, and yet were able to sow a record area, work most of it twice over, and finish in reasonable time. We noticed that we were able to commence after rain as soon, and in some cases sooner, than others with similar ground who used horses. Certain it is that if the soil is too wet for a tractor properly equipped, it is unfit to work at all. Again, if a tractor is attached to a header fitted with a power take-off device, it is possible to carry out stripping operations over ground on which it would be absolutely impossible to work at all with horses.

I believe that it is to the personal side of the matter that many failures can be attributed; not that the modern tractor is a very complicated machine, beyond the capacity of the average farmer to understand, but rather because the mechanical principles involved and the methods necessary in operation and in the care of the tractor, differ so vastly from those which we have been used to when working other machines. How often do we see a repair effected on a header or binder with a piece of wire or an undersized bolt, or perhaps a bolt an inch or two too long packed up with big nuts or washers? Such repairs are meant to be temporary, but they often last out a season. How often is oil used without any regard to its quality or freedom from dirt and dust? How often are repairs made and parts reassembled while still covered with grease and dirt?

A tractor works under such tremendous strains, and depends upon pure, high-quality lubricants, and any of the things just mentioned will soon put it out of action. In our own case, by strict attention to such things, and a careful overhaul in slack times, we have almost entirely eliminated those exasperating delays during the busy seasons, and have a machine that is now in better order than it was two or three years ago. The total area worked now stands at over 6,000 acres, including ploughing, harrowing, cultivating, discing, seeding, and stripping. Our machine was purchased at a time when the farm tractor industry, as we know it to-day, was in its infancy as far

as this country was concerned, and as the conditions in this country differ in many ways from those obtaining in other countries, the machines have had to be improved considerably to meet those conditions. Although we have had the successes mentioned with our machine, we feel certain that with the latest machine the same results could be obtained with far less trouble and expense.

In Memoriam.

Mr. J. A. ROBERTSON,

Died 26th September, 1927, aged 43 years.

It is with sincere regret that the Minister of Agriculture, the Hon. P. V. Stokes, M.L.A., and the Under-Secretary and Staff of the Department place on record their high appreciation of Mr. J. A. Robertson, M.R.C.V.S., by whose death the dairy cattle interests of the State and the Department have sustained well nigh irreparable loss.

Mr. Robertson's tenure of the office of Herdmaster for thirteen years has left an indelible impression upon the studs of the Department. Cattle, horse, and pig breeding operations have all been directed by him, and with a distinguished success that has indicated him to be among the most able breeders in New South Wales.

From the time of his appointment in 1914, Mr. Robertson applied himself especially to the improvement of the dairy studs and herds at the various Experiment Farms of the Department. This he accomplished with distinguished success, for the herds have been lifted from comparative insignificance to a notable position among the studs of the State. The Jersey and Guernsey herds, in particular, have obtained prominence in the show ring, but production has also been increased until they have reached a most conspicuous position not only in the Commonwealth but among the best producing herds in the world. This has been accomplished chiefly by the intuitive capacity for selection that belongs to the true herdmaster. New blood has been introduced from time to time, but sparingly, for the deceased gentleman possessed a genius for herd improvement by breeding and crossbreeding.

Outside his own particular sphere, Mr. Robertson was valued by his fellow officers for his sagacity and sound judgment, as well as for his genial qualities.

It is with a sense of his personal worth, and his notable public services, that this tribute to his memory is framed.

Economic Farm Management.

H. K. NOCK, Nelungaloo.*

TIME was when the "dud" of the family was decreed to be a farmer; later it was admitted that even on the farm some brains were "no harm"; to-day it is recognised that to be a success on the land the farmer must be an all-round man, and that brains, energy and adaptability are essential. As the Prince of Wales recently said, "It is useless to try and run a farm as a hobby." The farmer must be a bit of a chemist, a bit of an engineer, a bit of a botanist, a bit of a vet., &c.; but all these "bits" will not bring success unless his "corner stone" is sound business sense. And it matters not how much a man may produce. If the cost is above the value he is on the road to bankruptcy.

Let me define economics as the "study of relative values," and I ask what percentage of our farmers to-day are making fair wages for their work and ability, plus debenture rates of interest on the capital tied up in their undertaking? Are 25 per cent.? Are we not continually seeing men from the land selling out, taking a job, and investing their money in Government bonds? They are better off. It is to them an economic move, though it may reduce production and be detrimental to the State. Now, all conditions have some cause, and most conditions have some remedy. Can we help to deal with this? It is a recognised fact that profits vary in the same ratio as income and expenses, and to reduce the latter or increase the former has the same effect. Consequently a knowledge of economics, which deal with the elimination of waste, and the utilisation of labour (or time), land, and capital to their best advantage, from the time of purchase of the farm, is every farmer's need.

The Value of Land.

Commencing with land values, it has been proved that "with due allowance for social and educational advantages, due to situation," demand fixes land prices generally on the proved productive capacity, under the most capable and most efficient management, and only a neighbour, because of his ability to jointly work the property more economically than any new-comer, can afford to exceed such price, for in well-settled districts land is not available at prices based on what the easy-goer, the less efficient, or inexperienced, will produce; and beginners, or parents starting their sons, who fail to realise this fact will find that this is their first handicap. Far better to equip with agricultural experience and start in some lower-priced, decent rainfall district, where there is, at least, the chance of a rise in land values to compensate for other deficiencies. Another factor to be reckoned with is distance, and it is worth noting that portion of the big price margin in Victorian and South Australian land over New South Wales is due to

* Paper read at the State Conference of the Agricultural Bureau held at Hawkesbury Agricultural College, July, 1927.

the fact that their average freight to seaboard per bushel of wheat is about 3d. compared with over 5d. here, and the distance and condition of the road to rail has just the same effect. Now many men have refused land close to rail and purchased 10 miles back at £1 per acre less. Do they consider what they save, and lose? In interest they may annually save 1s. 3d. per acre, but to cart a 5-bag crop from half the area would alone cost this much more, while their superphosphate and other requirements of farm and household take either more time or more money to put them on or take them from the farm. Lambs not only take longer to truck, but bring less, because they are taken from their mothers a day earlier, while machinery is often out of action half a day, waiting for duplicates. A car, I know, will quickly cover distance, but cars do not yet run on air. So, when buying your farm, consider these points.

Profitable Utilisation of Capital.

Next, take improvements. These, obviously, are controlled by two factors—the value of the capital required, and the service or value of the improvements. But note how capital's value varies. At the "kick-off" it is worth twice as much to a man as when he is well established; indeed the bank's general overdraft rate of 7 per cent. compared with what our Savings Bank gives on current account (and this is the highest) is almost double. To the unspeculative man with a surplus, Government bonds rate, about 5½ per cent., represents the maximum, but what is the value of capital to the man who cannot get it? How high this could go is determined, as stated, by the service of the improvement which awaits it, or the profit to be made on the investment available. With good feed and a wise stock purchase, the rate of 100 per cent. per annum has often been exceeded for periods, while for lack of capital for improvements, good lands are at times quite unproductive. Its absence has hampered hundreds, but it must be used with wisdom, for unwise expenditure has commonly caused the failure of beginners.

The money spent on the house is often an example of this. Six years ago two settlers with small deposits, and each with £800, and equal plants, settled on similar blocks of a subdivided estate, with high hopes, and "I am going to make my home here and may as well do it first as last." No. 1 put £600 into a house, leaving £200 for seed, superphosphate, and the year's living. For £250 No. 2 erected what would eventually be the rear of his home. For a similar amount he erected an implement shed, fencing, and another tank, and put £100 in sheep. Which would you back? Six years have told their tale. No. 1 has lost his money, condemned farming, and is back on the labour market. No. 2 is putting the front on his house, has his banker's confidence, and a stocked and well-improved property. Economics, by intuition, made him recognise the relative value of capital in the different positions, and he was prepared to wait for the extra home comforts until the value of capital became normal. No. 1, who put his cash into the house, grew splendid feed, but with no fence between it and the crop it could neither be sold nor used, his crop had to pay the interest on that grass land, and instances are not uncommon where the interest on the unwatered, unfenced, or unproductive portions of a property, have forced a ruined

settler off the land. In 1919, a £50 fence across the rocky corner of a wheat paddock saved me £100 worth of chaff in a single season, and the fence is still an asset. There are no improvements which increase the productive capacity of a stocked holding more than adequate supplies of water and judicious fencing.

In our western district an extra £30 outlay for a mouse-proof as against an ordinary barn has been more than recouped by the loss avoided in a single plague year, and an implement shed, which for an annual £8 for interest and depreciation, will save half the appalling loss and wastage of machinery when idle. Colemans assert that their fortune was made by the mustard left on people's plates, and there is every reason to believe that McKay's fortune was largely augmented as a result of the thoughtless sun and weather waste which could have been avoided by the erection of a few sheets of iron.

Let us discuss the capital invested in machinery. Many farmers fail to notice the cost and value of machinery, and how few realise when it really is and is not economic to "scrap." They buy on two payments, with 8 per cent. added, and fail to see that with half down the accommodation works out at 16 per cent. per annum, which they cannot afford on present prices for produce. At the same time their banker would probably have financed them at 7 per cent. Few things, however, in farm management, demand more serious review than the subject of "scrap": it must be recognised that in farming, as in other industries, the evolution of machinery sometimes makes it uneconomic to discard machines before condemned by wear. The single- and double-furrow ploughs had their day, and ceased to be; the time lost was of greater value than the replacement cost. The broadcast seed-sower passed away, not on account of time loss, but by waste of seed; the combine is replacing the cultivator and drill; the harvester replaced the stripper and winnower, and in return was replaced by the header; and though all these introductions demand greater outlay of capital, they reduce the acre cost or increase the acre yield. But to the man who can save the combine's cost by de-wheeling the spring-tooth and stubpole, connecting it to his only half-worn-out drill at the cost of £1 10s., or whose harvester can efficiently handle the crops he has grown, their premature casting aside for a few days' time saved is waste, which to such extent must reduce his profit. This problem continually faces land men.

When, because top-dressing pays, the machinery agent rushes round to sell you a manure distributor, put it to the "relative value" test. He will tell you, "Your drill is too slow; you can do 30 acres per day with the new machine." Tell him that the £45 of your capital tied up in the new implement and freight represents nearly £8 for the year's interest and depreciation, for which, on the 150 acres to be treated, you get a saving of two days in time. Then do not worry about his business, but consider whether it will pay you.

It was Edmund Burke who said that "a sound system of economy was a revenue in itself," and if farmers generally would test their outlay by this method many would find their financial progress hastened. Of farmers

generally, bankers, who somehow seem reliable on these matters, will tell you that "in spite of the variety of their production of wheat, wool, and meat, many of the biggest producers are making very small profits." Hence it is necessary always to keep in view the relation of cost to value. If growing wheat leaves too small profit, mixed farming must supplant it; if big State sheep flocks make Merino breeding risky, more attention must be devoted to fodder crops for the fat lambs which export will absorb, for economics are void of sentiment and relentless to all who disregard them. Perhaps some men's biggest blunder is stocking up without provision for emergency. They cannot see good feed waste. They buy up, sell out, and may make a profit. They buy again, the unexpected dry spell demands disposal, and only buyers at gift prices can be found. These men have made some money with one hand, but thrown more away with the other. What, at such a time, is the value of the £100 stack that avoids the big loss by carrying him over, possibly for but a fortnight, till the season breaks.

Farmers should also watch for profitable current outlay. Take pasture top-dressing, for instance. The recorded experiments throughout the State show that the application of 5s. worth of time and superphosphate has increased the average carrying by one and a half sheep per acre, surely worth 15s., plus the residual value. Watch the seeding of crops. The difference between 45 and 60 lb. of seed is returning a bag more per acre. Then superphosphate for crops—though, in a few districts, the land has not yet responded, in many districts 60 lb. at a cost of 3s., has added bags to the yield; in others 1 cwt. may be needed for the same result, and intelligence and observation are continually necessary to discern the most economical quantities to use in different places. Again there is the lamb business. The saving of the price of a ram may mean forty lambs less in each year's marking. Does that pay? Then there are times when it pays to consider the losses of time and sheep which can be avoided by the erection of a windmill on the boggy tank, and the outlay of capital on things like these, or the purchase of stock to use surplus grass, when prices are above the average, are just a few instances to show how necessary it is for the farmer to have keen business capacity.

Influence of Time Value on Profits.

Now let me touch on time. We have seen how land value varies; we have seen how capital's value varies; and the variation in time's value is quite as great, and the part it plays is equally important. Hence wisdom must be exercised in directing your own and your workmen's time into the most profitable channels. For the capable farmer to be reducing his time for productive work by jobs that a youth can do, such as feeding the pigs or fowls, or milking the cows, is nothing short of waste, while on the other hand relegating the lambing ewes to the average farm hand, where an hour's personal attention in the early morning may save £20 per week, is often an expensive mistake. Indeed, I would go further and say that on most fair-sized holdings, where there may be a sick animal, a broken fence, or sheep to supervise, it should be recognised that the general management and stock

require more skill than most implement driving, that the farmer's time is more valuable when applied in this direction, and it is uneconomic for him to be continually tied to a team. Pages, of course, might be filled, in a paper like this, with details. But let me give you a few. With machinery some forget that oil is cheaper than duplicates, and on every farm it is often the case of "a stitch in time." Adjustments have to be made, and five minutes spent occasionally tightening nuts, &c., have often saved a breakdown. Straining a broken wire in a fence at once may keep a flock out of the ripe wheat, where their entrance would spell suicide and destruction. An hour spent raking straw from around the wheat heaps may save them from fire. £10 spent early on burr-cutting may mean £20 more for wool, or the same amount in destroying rabbits may mean £50 worth more grass. Many have learned that the fire risk and loss of weight on their bags of waiting wheat, often exceed the contract carter's charge, and though many of these jobs seem unprofitable, it is the relative value of costs and results that should decide things. Take gates. Against the £5 capital outlay, put the five minutes lost by a man and a team, often four times a day opening and closing a rail or barbed wire fixture, and you will admit that any opening of frequent use demands a good one. And many of you know how much the equipment of a blacksmith shop and the carrying of a small stock of assorted bolts will save a farmer.

There is one more point, however, that no land man can afford to overlook, and that is the fact that in working with nature it is often action at the opportune time that gives it value. To springtooth your fallow one week may add hundreds of bags to your crop. To do the same thing under hot, dry conditions in March not only wastes the value of your time, but may give you take-all, foot-rot, and failure. To clean your tank drains in autumn may mean water for the year. To mark the lambs when flies are bad may mean no end of work, and perhaps it was because of his appreciation, even in his time, of the multiplicity of the farmers' problems that Virgil wrote: "The Almighty decreed that the life of the agriculturist should not be an easy one."

In conclusion let me say that it is not the good teamster, or the man who can plough the straight furrow, that is usually the success on the land, but the man with capacity for management, the man who will not tolerate waste, who ever keeps in view the product's costs and value, and who does the things that pay.

Correction.—The statement was made on page 720 of the last issue of the *Agricultural Gazette* that "bran is not a very satisfactory food for ruminants on account of its tendency to become sour, and because of its cost." As the context perhaps suggested, it was intended to convey that "bran *by itself* is not very satisfactory." As a matter of fact, considerable quantities of bran are fed to ewes in lamb, but always in association with something else, such as chaff.—E. A. Elliott, Sheep and Wool Expert.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
Hygienic Dairy Company, Glenfield Farm, Casula, Liverpool ...	113	6 Oct., 1927
New England Girls' Grammar School, Armidale	14	15 " 1927
Lunacy Department, Morisset Mental Hospital	16	18 " 1927
Department of Education, May Villa Homes	6	3 Nov., 1927
Department of Education, Eastwood Home	10	3 " 1927
Department of Education, Hurlstone Agricultural High School ...	47	4 " 1927
Lunacy Department, Rydalmere Mental Hospital	61	23 " 1927
A. E. Collins, Hazelhurst Dairy, Bowral	18	6 Dec., 1927
Miss Brennan, Arrankamp, Bowral	27	7 " 1927
Lunacy Department, Callan Park Mental Hospital	26	15 " 1927
Department of Education, Yanco Agricultural High School ...	26	12 Jan., 1928
A. V. Chaffey, "Lilydale," Glen Innes	15	25 " 1928
Lunacy Department, Kenmore Mental Hospital	99	1 Feb., 1928
Walaroi College, Orange	2	3 " 1928
Lunacy Department, Orange Mental Hospital	3	7 " 1928
Australian Missionary College, Cooranbong	51	11 " 1928
Department of Education, Gosford Farm Homes	18	18 May, 1928
William Thompson Masonic Schools, Baulkham Hills	34	31 " 1928
E. P. Perry, Nundorah, Parkville (Guernseys)	30	8 June, 1928
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	38	11 " 1928
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys) ...	70	16 " 1928
Department of Education, Mittagong Farm Homes	30	22 " 1928
Sacred Heart Convent, Bowral	11	23 " 1928
R. Burns, Wilga Glen Dairy, Coonamble	49	28 " 1928
Dominican Convent, Moss Vale	4	24 " 1928
Kyong School, Moss Vale	2	3 Aug., 1928
Marist Brothers' Training School, Mittagong	80	25 " 1928

—MAX HENRY, Chief Veterinary Surgeon.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1927.

Society and Secretary.		Date.
Deniliquin (P. Fagan)	Oct.	18, 19
Griffith (W. Sellin)	"	18, 19
Millthorpe (W. P. Smith)	"	18, 19
Cootamundra (W. W. Brunton)	"	25, 26
Nabiac Spring Carnival (E. A. Carey)	Nov.	4, 5
Lismore (H. Pritchard)	Nov.	16, 17, 18
Orara (H. E. Hindmarsh)	"	29, 30
Grafton Summer (L. C. Lawson)	Dec.	2, 3
Albion Park (H. R. Hobart)	"	31, Jan. 2

1928.

Society and Secretary.		Date.
Dapto (E. G. Coghlin)	Jan.	13, 14
Bangalow (W. H. Reading)	"	25, 26
Gosford (E. H. Fountain) ..	Feb.	10, 11
Leeton (W. Roseworn)	"	14, 15
Cessnock (D. B. McGilvary)	"	16, 17, 18
Newcastle (E. J. Dann)	"	21 to 25.
Dorrigo (J. H. Skeoch)	"	28, 29
Tumut (H. Mount)	"	29, Mar. 1
West Maitland (M. A. Brown) ..	"	29 to Mar. 3
Nabiac (E. A Carey)	Mar.	1, 2
Robertson (J. K. Hamilton)	"	2, 3
Nimmitabel (R. Draper)	Mar.	6 to 8
Tumbarumba (M. Kinstler)	"	6, 7
Taree (R. Plummer)	"	7, 8, 9
Moss Vale (W. Holt)	"	8, 9, 10
Crookwell (P. R. Marks).. ..	"	13, 14, 15
Armidale (A. McArthur).. ..	"	13 to 16
Kempsey (N. W. Cameron) ..	"	21 to 23
Blayney (J. H. Moore)	"	27, 28
Sydney Royal (G. C. Somerville)	April	2 to 11
Grafton (L. C. Lawson)	"	25 to 28
Kyogle (D. Campbell)	May	9, 10

The Dicky Rice Weevil.

(*Maleuterpes* (*Prosayleus*) *phytolymus*) Olliff.

A. R. WOODHILL, B.Sc.Agr., and S. L. ALLMAN, B.Sc.Agri, Assistant Entomologists.

THE Dicky Rice weevil (*Maleuterpes* (*Prosayleus*) *phytolymus*) was first described by Olliff in 1895 from adult specimens collected at Kurrajong, New South Wales. In 1920 L. Gallard published a description of the eggs, larvae, and pupae, with notes on the life-history, &c. Owing to the damage caused by this pest in recent years it was decided in 1925 to carry out experiments for its control, and the results, together with a description of the insect, are given below.

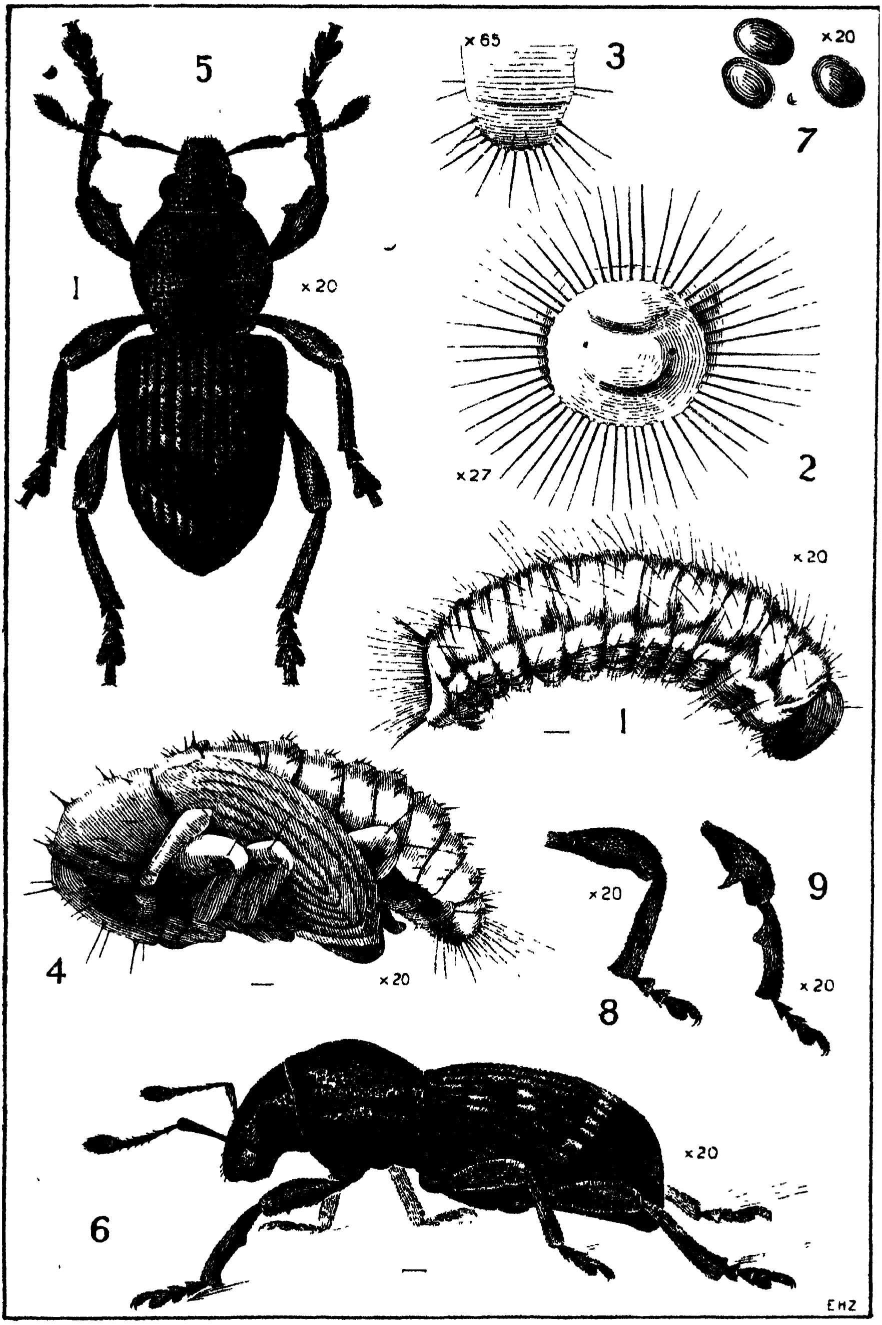
Description.

The adult insect is a rather robust, brownish-coloured weevil, with greyish-white markings on the prothorax, wing covers, and legs, and measuring 2½ to 3 mm. in length. The wing covers are somewhat broader than the prothorax, and have prominent shoulders. The males may be distinguished from the females by the presence of a long, curved spine about the middle of the femora, and a less pronounced spine about the middle of the tibiae of the anterior pair of legs. Both males and females have an even less conspicuous spine at the apices of the anterior tibiae. The eggs are dark amber coloured, ellipsoidal in shape, and ·4 mm. in length.

The larvae when full grown are whitish coloured, legless grubs, about 3 mm. in length, having a circle of distinct reddish brown bristles on the dorsal surface of the terminal segment. The pupae are of the same colour and approximate size as the larvae, with the legs, wing covers, eyes, and antennae of the adult insect plainly visible.

Life History and Habits.

While the detailed life-history has not been worked out, observations show that there are apparently two broods in the year. The first brood of adult beetles emerges from the soil from August to October, and, as noted by L. Gallard under laboratory conditions, specimens taken during that period deposit eggs in the soil, which hatch about twenty-eight days later. Field observations show that pupae and full-fed larvae are present in the soil during January, and from these a second brood of beetles emerges during the latter part of January and February. While this second brood of beetles has not been observed to lay eggs in the autumn, it is probable that this takes place, and that the insect overwinters in the larval or pupal state, as adult beetles have not been observed during the winter months, and pupae and fully-fed larvae have been observed in the soil in the spring, that is, August and September. The larvae and pupae are found at depths of from 4 to 9 inches in the soil.



Life History of the Dicky Rice Weevil (*Maleuterpes (Prosayleus) phytolymus*).

1. Larva of weevil. 2. Spined process on tip of abdomen of larva. 3. Tip of abdomen 4. Pupa. 5. Dorsal view of perfect beetle. 6. Side view of same. 7. Eggs. 8. Foreleg of female beetle. 9. Foreleg of male beetle.

The larvae have been recorded feeding on the roots of citrus trees, and especially of nursery stock. The adults feed on the skin of the fruit, particularly in the early stages of its development, and on the foliage, being more attracted by young tender growth than by the older leaves.

While the adult beetles have perfect wings, they have never been observed to fly, and it is almost certain that they do not do so under natural conditions, since they are normally unable to gain access to a tree if they are prevented from crawling on to it. In order to obtain data on the method of distribution, 1,400 weevils were stained with an alcoholic solution of rosalic acid and shellac in December, 1925, and 1,000 were liberated on one tree in an area where no control measures were used, and 400 were liberated under a tree which had been banded with sticky material. Owing to continued and excessive rains causing the weevils to drop to the ground and remain inactive, the results were vitiated to a great extent, but a number of stained specimens were found a week later at a distance of 40 feet from the point of liberation, showing that the weevils were capable of crawling from tree to tree.

This insect has not been definitely recorded by the writers as feeding on anything except citrus trees, though Olliff, in 1895, mentions it as feeding on peach trees and garden plants.

It has only been recorded from New South Wales, and so far only in the Ryde, Castle Hill, Dural, and Kurrajong districts of this State.

The Injury it Causes.

The most serious loss is caused by the adult weevils feeding on the skin of the young fruit. The weevils commence to feed as soon as the fruit sets, and the greater part of the injury is caused during the ensuing three months. This injury, when severe, takes the form of a network of irregular furrows, which turn black by the time the fruit ripens, causing a very marked disfigurement, with a consequent lowering of market value.

When the weevils are numerous, up to 70 per cent. of the fruit may be badly disfigured, and a further 20 per cent. slightly marked. Considerable damage may also be caused to the foliage, particularly in the case of young or re-worked trees, in which the growth may be greatly retarded or even arrested.

The larvae, which feed on the roots, have not been recorded as causing any very widespread damage.

Control Methods.

A number of different control measures, such as arsenical sprays and the use of different banding materials, have been tried from time to time, but none have given satisfactory results. It was decided to give some of these methods a further trial, and to try out new methods during the seasons 1925-26 and 1926-27. Experimental areas were therefore selected at Dural

and Kurrajong, and the following methods of control were tested during 1925-26:—

(1) Poison bait sprays—
    (*a*) Lead arsenate 4 oz., molasses 4 lb., juice of 12 oranges, water 4 gallons.
    (*b*) Similar to (*a*), using calcium arsenate instead of lead arsenate.
    (*c*) Sodium arsenite ¾ oz., molasses 4 lb., juice of 12 oranges, water 4 gallons.

(2) A spray of lead arsenate, 18 oz. of powder to 50 gallons of water, plus casein-lime spreader.

(3) Bands of cloth and oil baize treated with sodium arsenite bait as above and placed round the tree trunk, and boards painted with same mixture placed on the ground round the trunk.

(4) Bands of sticky material, such as bird lime and proprietary substances, painted either direct on trunk or on bands of paper and oil baize.

The results from these methods were obtained by observations in the field, by comparative counts of weevils on the trees made by shaking them off on to sheets, and by counts of the injured and uninjured fruit at the time of picking. It was found that the sodium arsenate and calcium arsenate poison bait sprays seriously damaged the trees and could not be used, while the lead arsenate sprays, both with and without the addition of fruit juice and molasses, did not give an efficient control, even when repeated several times. The poison bait mixtures placed on cloth and oil baize bands and on boards dried out very rapidly, gave no control, and in some cases injured the bark.

The bird lime bands commenced to run shortly after application, and were not effective. However, two proprietary tree banding materials of a sticky nature gave excellent results, and reduced the damage to foliage and the percentage of injured fruit very considerably. Only the banding experiments were therefore continued in the 1926-27 season. Of these proprietary substances, one was only available in small quantities in 1925, and the other (Ostico) was therefore used in most of the 1925-26 experiments, and in all the experiments in the following season.

Results of Banding Experiments.

The following gives the details of the banding experiments at Dural and Kurrajong during 1925-26-27.

During September, 1925, 218 orange trees were banded at Dural, and fourteen were left as controls. The owner of the orchard also banded some 600 trees. At the same time six trees were banded at Kurrajong and two were left as controls. During October, 1926, sixty trees were banded at Dural and forty were left as controls, while ninety-four trees were banded at Kurrajong and seventeen left as controls. An orchard which was not banded, and which was adjacent to one of the experimental blocks at Kurrajong, was also used as a control.

In the 1926-27 experiments all the bands were scraped to renew the surface, and fresh material applied where necessary during December and early January. A number of banded and control trees were selected from different parts of each of the experimental blocks, and the whole of the main crop from each of these trees was picked and examined. Most of the

trees used were small, and the number of fruit per tree consequently rather low. The following tables give the results in detail:—

NUMBER of fruit injured by Dicky Rice Weevils.

Year.	No. of trees.	Total No. of fruit examined.	Banded.		Control (not banded.)	
			No. of fruit examined.	No. of fruit injured.	No. of fruit examined.	No. of injured fruit.
1925-26.						
Dural	30	1,383	821	199	562	466
Kurrajong	20	1,061	535	229	526	519
1926-27.						
Dural	*	809	517	18	292	180
Kurrajong	15	2,558	1,134	173	1,424	1,009

* The 100 trees used in this experiment had been picked over before estimates were made, and the number of fruit shown represents the total remaining crop from 60 banded and 40 control trees.

PERCENTAGE of injured fruit from banded trees, and from trees not banded, and the percentage of reduction of injured fruit due to banding.

Year.	Percentage of injured fruit from banded trees.	Percentage of injured fruit from trees not banded.	Percentage reduction of injured fruit due to banding.
1925-26.			
Dural	24·2	82·9	70·8
Kurrajong ...	42·4	98·6	56·9
1926–27.			
Dural	3·4	61·6	94·4
Kurrajong ...	15·2	70·8	78·5

It will be seen from the second table that a very satisfactory reduction in the percentage of injured fruit was obtained as a result of banding. The percentage of reduction varies in accordance with the attention that is given to the bands after application. Thus at Kurrajong in 1925-26, where a reduction of 56·9 per cent. was obtained, the bands were applied in September and no further attention was given. On the other hand, in 1926-27, when a reduction varying from 78 to 94 per cent. was obtained, the material was applied in October, and was freshened at the end of December by scraping the surface and by the application of a little fresh material where necessary. In one case under observation during the experiments, thirty lemon trees had been cut back and reworked, but had made hardly any growth for two seasons owing to the weevils feeding on the new growth as it appeared. When, however, these trees were banded they recovered rapidly and made vigorous new growth.

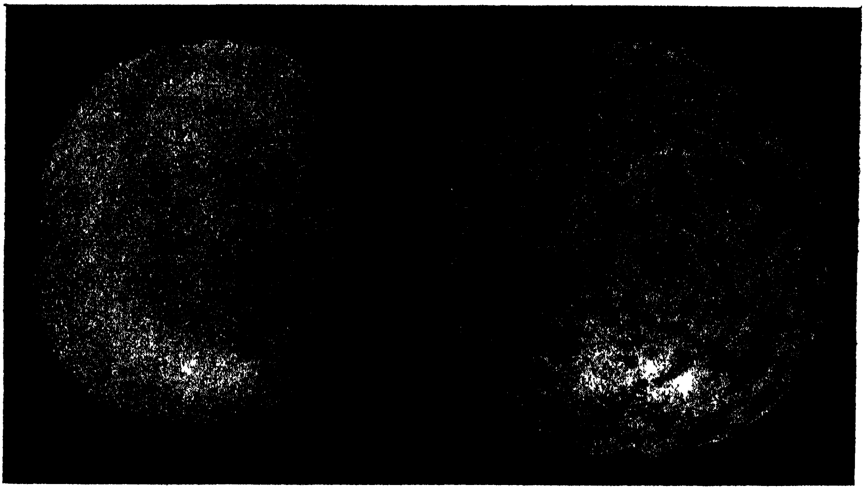
Time and Methods of Application.

Banding should be carried out during or at the end of the blossoming period, *i.e.*, before the fruit commences to set, as it is in the early stages of the growth of the fruit that most damage is caused by the weevils. The

Foliage of Citrus Tree damaged by Dicky Rice (*Maleuterpes* (*Prosayleus*) *phytolymus*).

trees should be pruned so that all foliage is kept at a distance of at least 6 inches from the ground. Weeds and grass should not be allowed to grow up and touch the branches, as this provides a means for weevils to reach the trees, and thus destroys the effect of the bands. The trees should be sharply jarred with a padded mallet immediately prior to banding, in order to dislodge any weevils already present.

As it was not known whether the application of the sticky banding material directly to the bark would be injurious, the method used for the majority of the trees was to tie a strip of grease-proof paper or oil baize round the trunk, and to apply the banding material on this. The paper should be 3 to 4 inches wide, and the banding material should be applied with a flat stick, so as to form a band 1½ inches wide, and from $\frac{1}{16}$ to $\frac{1}{8}$ inch thick. It is necessary to tie the paper tightly with string, top and bottom,



The Effects of Attack by Dicky Rice.
Sound and Injured Fruit compared.

to prevent the weevils from crawling underneath it. Where there are hollows in the trunk, a small quantity of the banding material should be placed in the hollow between the paper and the trunk.

Another method which is reported to have given equally good results, and which would certainly result in a saving of time, is to paste the strips of paper on to the trunk with ordinary flour paste. By this method the trouble caused by grooves in trunk could be obviated, as the paper could be pressed into them. The method should be practicable in a normal season, but with heavy rains there would be a tendency for the paper to fall off.

Cheap grease-proof paper, at about 6d. for twenty-four sheets, will last on the trees until the end of the summer if securely tied. For a banding material to be successful it should not run nor melt when subjected to the

heat of the sun, and should not dry out, but should retain its sticky qualities for six months.

After the bands have been placed on the trees it is necessary to keep them in such condition that they prove an effective barrier to the weevils. This is ensured by scraping the bands with a flat stick in order to make a fresh surface, and, where necessary, applying a little more material. This operation should take place at intervals of about two to two and a half months. If the weather is very dry, with strong winds, which carry dust, dead leaves, &c., on to the bands, more frequent attention will be necessary.

The band should be applied as high as possible on the trunk below the branches, because, if placed low down near the ground, it is likely to become coated with dust, leaves, &c.

With regard to applying the banding material direct to the trunk, some evidence was obtained in the case of several young trees where the trunk was exposed to the sun that a certain amount of injury to the bark took place. On the other hand, the band was applied directly to the bark of some hundreds of trees without any apparent injury resulting, though in these cases most of the trees were well grown and their trunks were shaded by the foliage. However, the effect of direct application to the bark for a number of consecutive years is not yet known, and orchardists are advised for the present at least to use the paper bands under the banding material.

Cost of Banding.

The banding material costs approximately 3s. per lb., and 1 lb. will band thirty trees with trunks 5 inches in diameter. A man can band 200 trees per day, using the grease-proof paper and twine method. Taking the labour, therefore, at 14s. per day, the following gives the approximate cost of banding 100 trees, with trunks 5 inches in diameter.

	s.	d.
Banding material	10	0
Paper	0	4
Twine	1	0
Labour	7	0
Total	18	4

This would be roughly 2 1-5 pence per tree with trunks 5 inches in diameter. The cost would, of course, be lower for young trees, and higher for very large trees.

Summary.

The damage caused by the dicky rice weevil can be effectually prevented by banding the trunks of citrus trees with a suitable sticky material, so that the weevils cannot gain access to the fruit and foliage by crawling up the trunk, provided that—

(*a*) The branches are jarred with a padded mallet immediately prior to banding, if any weevils are present.

(*b*) Banding is carried out in the spring just before the fruit commences to set.

(*c*) The trees are kept pruned so that all the branches are at least 6 inches above the ground, so that the weevils cannot reach them.

(*d*) Weeds and grass are not allowed to grow up under the trees and touch the branches, since they then form a ready means for the weevils to reach the trees.

(*e*) The necessary attention is given to the sticky bands after application, freshening the surface if it becomes coated with dust by scraping with a flat stick, and if necessary adding a little more material.

The method described in this article is therefore definitely recommended to growers, who are urged to use it in districts where the dicky rice weevil is prevalent.

The writers desire to acknowledge with thanks the helpful co-operation of Messrs, Armstrong, Tate, and Arnold, of Kurrajong, and Mr. Archer, of San Remo, Dural.

REFERENCES.

A. S. Olliff. Some Australian Weevils or Snout Beetles. *Agri. Gaz. N.S.W.*, vol.VI., p. 259.
L. Gallard. Notes on the Dicky Rice Weevil. *Agr. Gaz. N.S.W.*, vol. XXXI, p. 280.

INFECTIOUS DISEASES REPORTED IN AUGUST.

THE following outbreaks of the more important infectious diseases were reported during the month of August, 1927 :—

Anthrax	1
Pleuro-pneumonia contagiosa	7
Piroplasmosis (tick fever)	Nil.
Blackleg	1
Swine fever	3

—MAX HENRY, Chief Veterinary Surgeon.

BETTER FARMING TRAIN—OCTOBER ITINERARY.

The following is the programme which has been adopted for the Better Farming Train in the month of October :—

October	11	Werris Creek.	October	20	Moree.
"	12	Gunnedah.	"	21	"
"	13	"	"	22	Biniguy.
"	14	Boggabri.	"	24	Inverell.
"	15	Narrabri.	"	25	"
"	17	"	"	26	Delungra.
"	18	Wee Waa.	"	27	Warialda.
"	19	Bellata.			

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

Potatoes—	
Satisfaction	Hillen and Leckie, "Cherragorang," Taralga.
	J. J. Maloney, jun., Stonequarry-road, Taralga.
Factor	W. Reddacliff, Milgarra, Tenterfield.
Batlow Redsnooth	T. A. Howard, Cottawalla, Crookwell.
	E. M. Herring, "Sheen," Batlow.
Maize—	
Leaming	Manager, Experiment Farm, Grafton.
Golden Glow	P. Kelly, Leech's Gully, Tenterfield.
Fitzroy...	Manager, Experiment Farm, Grafton.
Broom Millet	W. T. McDonald, Taree Estate, Taree.
Grasses—	
Sudan Grass	C. Bennett, Forbes-road, Cowra.
Sweet Sorghums—	
Collier	Manager, Experiment Farm, Grafton.
Selection No. 61	Manager, Experiment Farm, Grafton.
Sacoaline	Manager, Experiment Farm, Wollongbar.
White African...	Principal, H.A. College, Richmond.
Peanuts—	
Large White Spanish... ...	Manager, Experiment Farm, Grafton.
Soybeans—	
Biloxi	Manager, Experiment Farm, Grafton.
Otootan	Manager, Experiment Farm, Grafton.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

The Department's "Standard" Seed.

At a conference of Farm Managers and Agricultural Instructors of the Department, held in Sydney in July last, the term "standard" seed (applied to seed raised by experiment farms and supplied to private farmers and for farmers' experiment plots) came under discussion, it being opined that more would be conveyed to farmers by naming such seed "pedigree" seed. The use of that term has now been approved, and henceforth such seed will be designated "pedigree" seed.

Poultry Notes.

OCTOBER.

E. HADLINGTON, Assistant Poultry Expert.

IN last month's notes matters affecting brooding of chickens were dealt with and various causes of trouble were pointed out.

The Second Stage of Rearing.

The next stage in the rearing of chickens plays an important part in their growth, yet it is one which is not well provided for on many farms, with the result that chickens which have come through the brooders safely are frequently ruined through lack of suitable accommodation afterwards. There is a tendency to look upon the chickens as out of danger when they have left the brooders, and while this is so where suitable quarters are provided, there are many farms where no suitable provision is made for rearing up to the time the chickens have learnt to roost. The result is they receive a check in growth which affects their ultimate development.

It is a common thing at this time of the year to see batches of chickens among which are a number with practically no feathers. This is due to packing together for warmth, which results in sweating, and in time the downy feathers are rubbed off. Where the chickens are placed in open-fronted houses the trouble is accentuated, and deaths may also occur through the chickens crowding into a corner and thus being smothered.

If the chickens are properly handled after they are taken from the brooders, at say six weeks old, there should be no losses, other than by accident.

How to Prevent Losses.

The first consideration in handling the chickens after leaving the brooders is a cosy house, closed in except for an aperture of about 12 inches along the front, and another of 2 inches along the back for ventilation. A suitable size for the house is 8 feet long by 6 feet wide, 6 feet high in front and 5 feet at back. A long shed of the height and width mentioned can be divided with wooden partitions into 8-feet compartments.

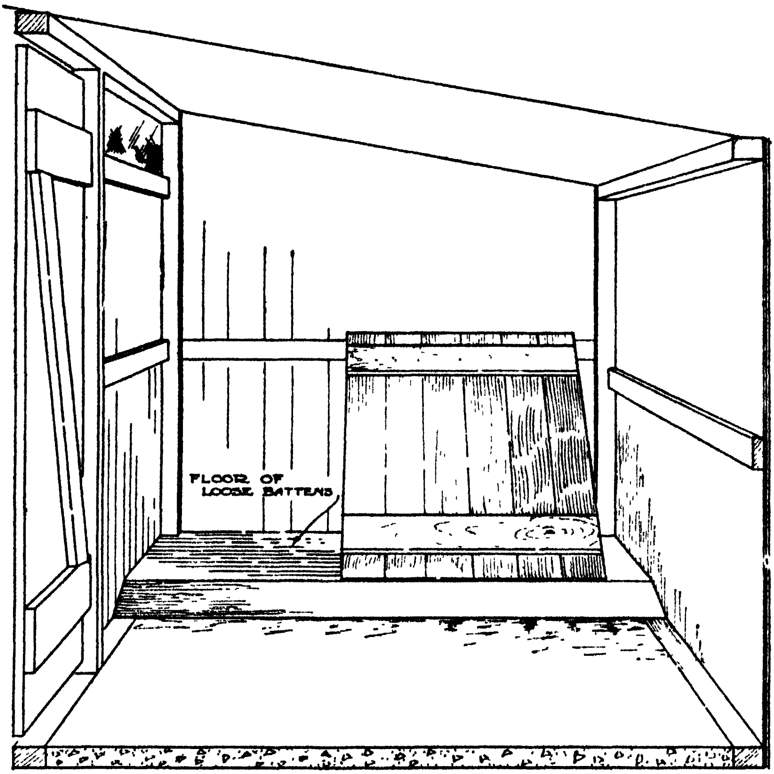
Ledge doors should be placed at the back of each compartment for attention to the chickens, and either a ledge or a trap door in front opening into the runs. A ledge door would, of course, allow the attendant to walk through the houses into the runs.

This class of housing is convenient for working, and the chickens do well in them up to about twelve weeks old. Furthermore, they are cheaper to build than separate houses and runs. Each unit will accommodate up to seventy-five chickens, which is as many as should be run together in any class of house.

The building should face the east, because at midday the house then casts a shadow on part of the runs, allowing the chickens to come out on hot days, whereas if the houses faced the north, the sun shines on the runs during the heat of the day and the chickens remain inside.

Teaching Chickens to Roost.

When the chickens are taken from the brooders, which should not be before they are six weeks old, or even a week older in the cold weather, the quicker they are taught to roost the better. A simple and effective method of

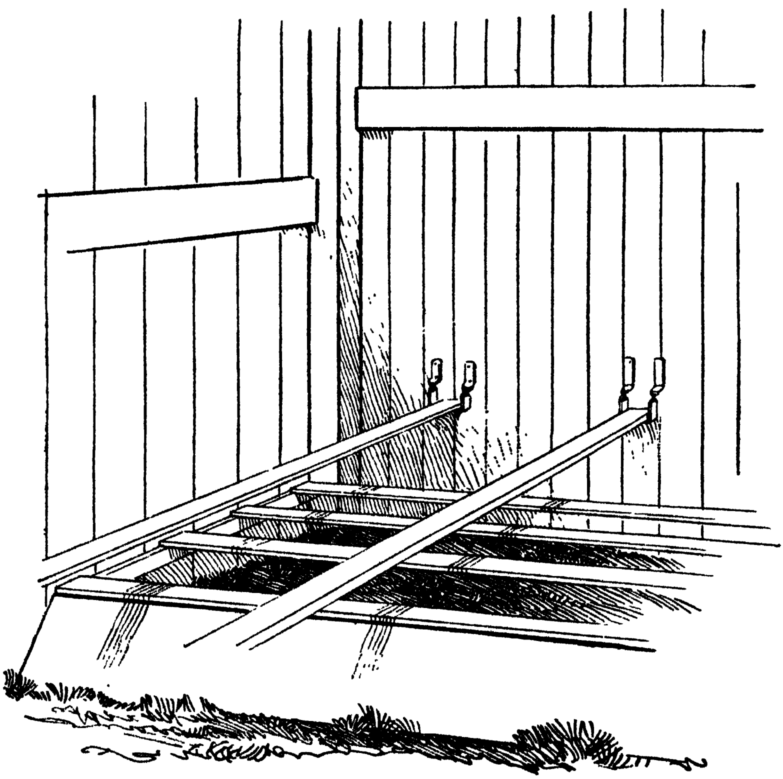


Interior of Rearing Pen, showing Moveable Platform and Cover Board in Position.

achieving this is shown in the accompanying illustrations. The idea is to fasten a cleat about 3 feet long to each side wall at the end of the house furthest from the doors, or even to lay two pieces of 4 x 2 in. wood along the sides, upon which is placed, loosely, twelve 3 x 1 in. battens, forming a low platform across one end of the house, which should be about 6 feet long by 3 feet wide. To prevent the chickens from getting underneath, a board about 7 inches wide is placed along the front, with a slope to facilitate the chickens getting up on the platform.

For the first two or three nights it is a good plan to lay a bag on the platform upon which is spread a coating of sand or litter. This applies more particularly to cases where the chickens have had to be put out of the brooders a little too soon or in cold weather. A cover board also, about 4 feet long and 3 feet wide, might be leaned up against the end wall as shown, and the chickens made to go under it, thus affording more warmth. Care should be taken to see that a space is allowed all round the cover board.

After the first few nights, the cover board and the bag covering the platform can be removed and one or two battens taken out. The rest should then be spaced a little apart, say, about half an inch. The chickens, upon



Last Stage in the System of Inducing Chickens to Roost.
The platform has been opened out to form perches, but eventually it is removed altogether, leaving the chickens to roost on the perches above.

finding it uncomfortable when they get their legs between the battens, remain upon them in the manner of a perch. This not only prevents them packing so closely together, but gives them the idea of roosting. As they become accustomed to the battens being spaced a little apart, the width is increased each few days, but care is necessary that they are not opened up wide enough for the chickens to get down between until they have learnt to roost. By

this time the two main perches are put in position running the full length of the house, and when the chickens go up on them the platform can be taken out. Only a few sets of battens are required, because, as the chickens learn to roost, the platform can be transferred for the next new lots, or the chickens removed to other houses.

If it is not possible to provide this class of house for the second stage of rearing, other houses may be adapted to the purpose. For instance, colony houses can be temporarily closed at the fronts all but about 12 inches at the top, and the battens fitted as described. After they have learnt to roost, the temporary front could be taken away.

Plans of rearing pens and other buildings are available on loan from the Department.

Errors in Feeding.

Quite a number of cases come under notice where mistakes are being made in feeding chickens, such errors covering the period from the first feed right through the different stages. In the first place, it is found that in many instances the first feed is far too long delayed. It will be remembered that in all the literature issued by the Department dealing with feeding of chickens, the advice is to give the first feed at thirty-six to forty-eight hours after hatching. Now this means exactly what is stated, but it is found that many farmers calculate the time from when the chickens are taken from the incubator, even though they may have actually been hatched twelve to twenty-four hours before. Worse still are the cases where day-old chicks are purchased, which have in many cases been hatched twenty-four to thirty-six hours before they are received by the farmer, and then are allowed to go without food for the time stated as from hatching. It should be remembered that when the time limit for feeding is exceeded the chickens are being starved, and many fine lots of chicks have been ruined in this way, the owner fearing to feed them too early in case the yolk has not been absorbed. This idea, like many others connected with poultry farming is being overdone. It would be better if farmers paid less attention to the non-absorption of the yolk, and followed definite instructions on the subject of feeding, because if feeding is not commenced sufficiently early the chickens become so weakened that many die off before they have even learnt to feed. It is a peculiar thing, but if chickens are starved too long, they will often not start to eat.

Many farmers go to such extremes in this matter as to open a chicken to see if the yolk is absorbed before feeding the batch. All such notions arise from the proverbial little knowledge which is dangerous. The fact is that the absorption of the yolk is not of nearly so much importance as many think.

Not only so, but the yolk, which is there for the sustenance of the chicken until it is strong enough to find food, is scarcely ever fully absorbed at thirty-six to forty-eight hours—in fact, not until many days later. Nevertheless, the chickens should be fed at the time stated from the actual hatching, and it is better to err on the side of feeding a little too early than too late.

Another mistake that is very prevalent among chicken-rearers is to continue feeding on rolled oats for several days. This practice, in the first place, often leads to constipation; and, secondly, it is not a perfect food in itself; therefore, rolled oats should only be fed for two days.

For a detailed system of feeding chickens from the shell to maturity, see the leaflet on "Rearing and Feeding Poultry," which is available from the Department. It might be stated, however, that after feeding for two days on rolled oats, there is nothing better than a crumbly mash of pollard and bran, mixed with milk, for feeding during the day, and one feed of chicken mixture for the last feed in the evening.

Another Cause of Trouble.

It will be remembered by readers of these notes and the literature on feeding already mentioned, that common salt is regarded as an essential in the food of chickens, but there is nothing in which lurks more danger if used carelessly, or in any other way than that so often advised. Some operators dissolve the salt in a small quantity of the water or milk, and pour that over the pollard and bran before adding the balance of the liquid. The result is danger of the salt remaining in a portion only of the mash. The correct method is to dissolve the salt in the *whole of the liquid* before adding it to the dry materials.

When using milk powder, the same care, or even more, is necessary. Only recently some cases of chronic salt poisoning have occurred which were found to be due to the operator mixing the salt and milk powder in a small quantity of water, mixing this with the pollard and bran, and then adding extra water to mix the mash.

Any ingredient of the mash which is saturated with a strong solution of salt is sure to cause more or less trouble. The moral is that if it takes a gallon of liquid to mix the mash, the salt should be dissolved in the whole gallon before the mixing is attempted.

Farm Positions Sought for College Students.

Several students of Hawkesbury Agricultural College, having completed the College Diploma Course, are desirous of gaining further practical experience, and will be available for positions at the end of the year. These students, who are about 19 to 21 years of age, have received a thorough grounding in the theory and practice of agriculture during the three years they have been in residence at the College, and can be recommended to station-owners and farmers desiring such services.

Some of the College students are also desirous of making use of the midsummer vacation (extending from 15th December, 1927, to 25th January, 1928), to gain practical experience on approved farms. These students are about 17 to 20 years of age, and would be glad to hear from possible employers.

Those desirous of obtaining the services of either students or ex-students might communicate direct with the Principal of Hawkesbury Agricultural College, Richmond.

Orchard Notes.

October.

W. J. ALLEN and H. BROADFOOT.

Spraying.

In localities in which apple and pear trees are susceptible to black spot, growers should seek to minimise if not practically prevent the trouble by timely spraying. Lime-sulphur or Bordeaux mixture have proved so efficacious that spraying, if practised in time, will keep the fungus in check.

With the calyx applications of lead arsenate, lime-sulphur or Bordeaux mixture should be combined at summer strengths, but it is as well to state that apples and pears appear to be more sensitive to Bordeaux mixture at the calyx stage, and the application of that fungicide should be avoided unless it is absolutely necessary to use it.

Upon Japanese plums, as well as upon nectarines and peach trees, a vigilant watch should be kept for the appearance of aphis, which, if they appear, should be sprayed with tobacco wash or one of the commercial nicotine extracts. In applying the spray use high pressure and repeat if necessary in two or three days.

The first or calyx spray should by now have been completed for codling moth in earlier districts, and in later districts the first application should be made during the current month. It will be conceded by most that the codling moth is the worst pest with which apple and pear growers have to contend. Any measures taken to keep it in check will be ineffective unless they are timely and adequate, and are concerted. Only thus can satisfactory results be achieved. The manner in which infestations can be reduced is well known to the majority of growers if not to all. There must be most careful inspection of bandages, of used cases, and of packing sheds, with destruction of any sheltering grubs before emergence. It is the carry-over grubs which start the new season's infestations. Growers who have not yet taken these necessary steps to minimise later infestations should do so as soon as possible. The practical effectiveness of bandages as one of the means of controlling this pest is strongly recommended. On leaving the fruit the grubs seek a sheltered place in which to pass on to the next stage of their development, and bandages offer an inviting and convenient harbour, in which sheltering grubs can be easily located and killed. The bandages should be inspected every fourteen days, any loose bark removed, and the butt of the tree carefully examined at ground level, as quite a number of grubs are often found sheltering there.

Spraying is a very important operation of the month, and one of the most important is the first or calyx application. To many varieties it is advisable to apply a double calyx spray, inasmuch as all blossoms do not open simultaneously and the time of all falling petals does not synchronise.

Spraying, it is hardly necessary to say, to be effective must be thorough. The right quantity of lead arsenate should be used and the mixture well agitated before and during spraying. The first spraying must be applied with sufficient power to force the poison into the cup or calyx. As the time during which the calyx spray can be applied is strictly limited, it will be necessary in many orchards, especially if they are large and have many varieties of apples and pears blossoming about the same time, to work long hours, but the difficulty must be faced resolutely. It is of no use to neglect it. The work must be completed when the flower is at the right stage, and it must be completed in a very thorough manner.

It is worthy of mention that many growers who have achieved, or who are getting good control, have the idea that they can cut down expense by cutting out some of the work in connection with warfare against the pest. This is a " penny wise and pound foolish " policy. It is easier and less expensive to keep the orchard clean than to clean up a dirty one.

Disbudding.

Grafted or budded stocks cannot be left without supervision. Those put in during the previous summer should be periodically examined—and in no perfunctory manner—to see that growths from the stock do not rob shoots from graft or from bud.

In cases in which new varieties have been worked upon old trees, it is not wise to rub out all shoots from the stock, but to pinch back some of the weaker ones, in order that they may afford shade until the shoots from the graft or bud have developed sufficiently to form a head. In the case in which any scions have failed, ample shoots from the stock should be left and budded later on.

The Care of Citrus.

In many localities heavy frosts have been responsible for the killing of the twigs and of some branches of citrus trees. It is not advisable to thin out the dead wood until some time after the trees have made fresh shoots. It is always as well to give the new shoots time to strengthen. By waiting, too, the piece of dead wood at the point at which the new shoot starts from a branch constricts, and the cut made by the removal of the dead branch is not so large as it otherwise would be, and consequently the cut will heal over more readily. Where the tops of young trees have been killed, but the stem or trunk is quite sound, they should not be cut back too soon, but should be treated in the same way as the older trees.

When the grafted portion of young trees have been killed, any good strong growth coming from the stock should be budded later.

Where trees have been defoliated, a spraying of thin lime wash may be applied to minimise sunburn, and in addition an application of ample organic matter, plus nitrogenous fertiliser, should be applied to hasten the tree to re-establish its productivity.

Keep the Cultivator Going.

There is every indication of a heavy crop of pome and stone fruit during the coming season, and effective cultivation will be necessary if the best results are to be obtained. Weed growth should be prevented and a good surface mulch maintained. These results will be obtained by persistent use of the cultivator.

Every intelligent grower clearly recognises the value of good cultivation. It encourages tree growth and the development of blossom buds, and it is absolutely necessary to the production of good quality fruit of satisfactory commercial size. It is a serious mistake to plant young trees and then neglect them. They should be kept clean and the circumjacent soil kept open. During the winter the subsoil in many districts did not get a good soaking, and this makes it all the more necessary to keep the soil in such condition that showers may penetrate, and that the moisture now in the soil may be conserved.

Surface Drains.

In order to prevent the loss of surface soil, growers should see that necessary drains are made to carry off storm water, which otherwise will transport the soil from higher to lower levels, and expense must be incurred in replacing it. The provision of sufficient drainage will save the grower subsequent loss of time and expense.

Some Additional Values of Farmyard Manure.

THE benefits derived from the liberal use of farmyard manure have been appreciated for thousands of years, but although its direct value as a provider of plant-food is great, it is more valuable as a soil improver. Farmyard manure is often used as a mulch, but it should be put *in* the soil, not *on* it; straw or plants pulled from the garden will make just as good a mulch. Farmyard manure loosens heavy, sticky soils and compacts loose, sandy soils; it increases the warmth of soils; it liberates other plant-foods; it increases the solvent action of the soil moisture; it increases the activities of the soil bacteria; and it tends to control injurious salts.—W. J. SPAFFORD, in the South Australian *Journal of Agriculture*.

ALL varieties of wheat in general use are equally acceptable to the grain buyer, provided the grain is sound and not red in colour, but for lamb-raising an intelligent appreciation of the qualities of the different sorts of both wheat and oats will often pay the farmer. Some will give earlier feed than others, and it will probably pay to make three sowings of, say, Mulga oats at intervals instead of one large seeding of Algerian, which, although it stands grazing well, is a much longer time in providing a picking for sheep. Again, sheep have preferences, and some oats, such as Algerian and Kelsall's, are not liked so much as others.—J. T. PRIDHAM, Plant Breeder.

Agricultural Gazette of New South Wales.

Agricultural Bureau Winter Fodder Championship.

Lower North Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

THE competition for the champion plot of winter fodder conducted amongst branches of the Agricultural Bureau of New South Wales on the Lower North Coast was considerably interfered with by exceedingly dry conditions throughout the winter and early spring months. Briefly, the object of the contest was to stimulate winter fodder production on more up-to-date and safe lines. The conditions set out that each farmer entering must have had at least 2 acres of fodder crop on the farm during the season, and have reserved ½ acre of it for judging on points about the end of August or early September, that time being regarded as the period of greatest scarcity. No really hard and fast conditions were imposed. The farmer could use his own discretion as to cultivation methods, class of fodder, and fertiliser, &c., to use; but full points could only be scored by the farmer who did things properly. By making the contest an inter-branch one, the spirit of friendly rivalry was stimulated, and this made the contest even more interesting. A trophy subscribed for equally by the Bureau branches competing was an additional attraction; this goes to the grower of the champion plot. Considering that such a wide area as from Kempsey to Dungog is covered, considerable honour attaches to the winning of the contest. Each branch of the Bureau conducts its own contest, and the winner automatically becomes eligible to compete for the champion trophy. Originally nine branches entered, but owing to the unfavourable season only five remained in at the finish.

The branches which originally entered and the number of entries in each local competition were:—

Temagog—Turner's Flat—Two entries. Withdrew; sown too late.
East Kempsey—Three entries. Withdrew; sown too late.
Hannamvale—Five entries. Mostly sown too late.
Dumaresq Island—Twelve entries. Four entries withdrawn; remainder mostly very good.
Taree Estate—Eleven entries. A number withdrawn; crops failed; some late.
Bulby—Five entries. Withdrawn owing to crops failing.
Mount George—Three entries. One withdrew.
Fosterton—Seven entries. Majority withdrew owing to crops failing.
Bandon Grove—

Comments.

Barely 1 inch of rain (the greater part in small, useless lots) fell over the three months mid-June to mid-September. It was one of the driest periods

ever experienced, and to increase the seriousness of the conditions, forty to fifty frosts occurred (usually not a quarter of that number are recorded) and westerly winds were incessant.

Whilst any old method—even ploughing once and then throwing the seed on—might give good enough results when the season is favourable, quite a number of farmers this year—fully 90 per cent.—found, to their

Sunrise Oats on Mr. Levick's Farm, Taree Estate.

Sunrise Oats on Mr. Shield's Plots, Mount George.

sorrow, that such slipshod methods were of no avail under extreme dry conditions, and just at a time when fodder was so badly needed very little was available. The contest proved beyond doubt that good, sound cultural methods—working the land at least three months before sowing, aiming at the conservation of moisture—growing the right sort of crop at the right time—using fertilisers—are methods that pay every time. The

good plots seen throughout the Lower Coast this season could be counted on both hands, and it is pleasing to record that with few exceptions they were all with Agricultural Bureau members. Where conservation of fodder is not practised the growing of winter fodders is of such vital importance to dairymen that it must take a place on every dairy farm on the Lower North Coast. There is no farm so small that a portion of at least 2 acres

Florence Wheat and Sunrise Oats at Mount George.

Sunrise Oats on Mr. J P Mooney's Farm, Dumaresq Island.

cannot be reserved annually for producing winter fodder on the best and safest lines. Farmers whose crops have failed might benefit by studying the methods adopted by the leading Bureau members. While some of the following operations might appear superfluous (or perhaps only necessary where a special effort is required) the general impression is that they give the best results. An early start with the preparation of the soil—fallowing at least for three months—additional workings (ploughing,

discing, &c.), but not so deep as to disturb the moisture stored in the sub-surface layer to ensure a sweetening and mellowing of the soil and a fine tilth for receiving the seed; the use of fertilisers (without a doubt the application of superphosphate and a top-dressing with nitrate of soda have proved most advantageous); sowing at the right time; and last, but not least, using the proper mixtures. Oats and wheat, plus legumes, is giving excellent results. Sunrise, Myall, or Mulga oats, with Gresley wheat, plus vetches and field peas, gives great bulk and a wonderful class of fodder.

Notes on the Plots.

Mr. K. Brimstone.—Alluvial soil, previous crop oats. Stubble ploughed November, 1926; twelve cart loads farmyard manure scattered evenly over the 2 acres and disced in prior to the first ploughing; ploughed again (shallower) January and again in March; after the heavy April rains the ground was disced and harrowed; sown 23rd April, top-dressed with ½ cwt. superphosphate and 28 lb. nitrate of soda on 23rd June.

WINTER FODDER CHAMPIONSHIP RESULTS.

Competitor.	Bureau Branch.	Fodders Grown.	Points Awarded.					
			Suitability of Fodder (max., 30 pts.).	Leafiness and Succulence (max., 15 pts.).	Stage of Maturity (max., 15 pts.).	Freedom from Weeds and Disease (max., 10 pts.	Yield (max., 2 points per ton of yield.	Total.
K. Brimstone ...	Dumaresq Island.	Sunrise oats, Gresley wheat, field peas, and vetches.	26½	14½	15	10	36	102
C. Shields ...	Mt. George	Sunrise oats and vetches.	21½	14	14	9½	34	93
A. Smith ...	Bandon Grove.	Myall oats, Gresley wheat, field peas, and vetches.	26	13	14	9½	27	89½
Levick ...	Taree Estate	Sunrise oats, Gresley wheat, vetches and field peas.	26	12	13	8	30	89
Bosworth Bros.	Fosterton ...	Sunrise oats, Thew wheat, field peas, and vetches.	28	14½	14	9½	19	85

Mr. C. Shields.—Alluvial soil, many years under cultivation. Ploughed September, 1926, fallowed till December, ploughed again; disc-harrowed several times; ploughed again March and double disc-harrowed; sown after heavy rain on 25th April, no fertiliser.

Mr. A. Smith.—Alluvial soil; in 1926 green maize and fodders. Ploughed September; disced and sown to cowpeas, which were fertilised with one bag of superphosphate per acre. Poor growth resulted owing to the dry spring, and the crop was rolled down and disced in early February, but it grew again after the rain. The plot was then ploughed late in February, and rolled and disced; disced or spring-toothed occasionally; rolled and shallow

ploughed; spring-toothed and sown on 12th April, and afterwards rolled and harrowed. Covered by flood on 15th April, which left the surface very hard; three and a half bags of fertiliser mixture were applied to the 2 acres.

Mr. Geo. Levick.—Alluvial soil, previous crop oats. Ploughed December, harrowed and rolled; ploughed again end of March or early in April; sown 13th April; superphosphate applied at 1 cwt. per acre. Heavy rain followed and caused considerable washing and caking of the surface.

Messrs. Bosworth Bros.—Alluvial soil; had been under lucerne for eight years. Ploughed with the disc 8th March and rolled; harrowed after rain and spring-toothed after further rain. Double-disc ploughed mid-April and rolled; flooded twice mid-April; sown 16th May (spring-toothed in and rolled); peas and vetches in rows 2 feet 3 inches apart, the former at 30 lb. and the latter at 20 lb. per acre. The stand was on the thin side, due possibly to the spring-toothing covering some seed too deeply, and to the sowing being rather late.

"Insects of Western North America."

THE "Injurious and Beneficial Insects of California" by E. O. Essig, of California University, has proved of considerable value to economic workers in entomology in New South Wales, but in his more recent work, "Insects of Western North America," the same author has contributed more comprehensively to the study of economic entomology, and the volume now before us should prove of even greater value to students and workers. Some of the species dealt with in the volume as occurring in the western part of the United States are also present in New South Wales, while of the other insects described by Professor Essig, we have a large number of related species that cause somewhat similar damage, so that the issue is of considerable interest to this country.

The work is of an extensive and thorough character, for not only does it present the author's first-hand knowledge and experience, but an attempt has been made to glean from the large entomological libraries in the western states and throughout America information that might be useful; so that the work is a most complete one.

The book, which is systematically arranged according to the orders, consists of twenty-eight chapters and over 1,000 pages. Chapters 1 and 2 are devoted to the various classes of the phylum Arthropoda; chapter 3 to the general classification of insects, and the remainder of the book, consisting of twenty-five chapters, to an account of the insects under their respective orders. In each chapter a brief account is given of the order, with useful keys to the sub-orders and families. The more important species are particularly dealt with, while those of lesser importance are also listed. Short descriptions and accounts of the life histories of many species are given, and economic significance and controls are indicated where necessary.

Reference to the various authorities quoted are given throughout the book, which thus forms a useful bibliography. The book is copiously illustrated with half-tone and line blocks, and should prove a very useful reference book in our libraries.

Our copy from the publishers, The MacMillan Company, New York

Unit Value of Fertilising Materials.

The unit values of fertilising ingredients in different manures for 1927 are as follows:—

	per unit.
Nitrogen in nitrates	21s. 11d.
„ ammonium salts	16s. 6d.
„ blood, bones, offal, &c.	17s. 1d.
Phosphoric acid in bones, offal, &c.	4s. 11d.
„ (water soluble) in superphosphate	5s. 3d.
Potash in sulphate of potash	6s. 9d.

To determine the value of any manure the percentage of each ingredient is multiplied by the unit value assigned above to that ingredient, the result being the value per ton of that substance in the manure. For example, a bonedust contains 4 per cent. nitrogen and 20 per cent. phosphoric acid:—

4 × 17s. 1d. = £3 8s. 4d. = value of the nitrogen per ton.
20 × 4s. 11d. = £4 18s. 4d. = „ phosphoric acid per ton.

£8 6s. 8d. = value of manure per ton.

It must be clearly understood that the value thus assigned, depending solely upon the chemical composition of the manure, does not represent in all cases the actual money value of the manure, which depends upon a variety of causes other than the composition, and is affected by local conditions; neither does it represent the costs incurred by the manufacturer in the preparation, such as cost of mixing, bagging, labelling, &c. It is simply intended as a standard by which different products may be compared. At the same time it has been attempted to make the standard indicate as nearly as possible the fair retail value of the manurial ingredients, and it will be found in the majority of cases the price asked and the value assigned are fairly close.—A. A. Ramsay, Chemist.

Lamb-raising Trials at Cowra Experiment Farm.

Lincoln-Merino ewes from Wagga Experiment Farm and Border Leicester-Merino ewes from Cowra Experiment Farm were mated with Ryeland and Dorset Horn rams at Cowra Experiment Farm and fifteen representative lambs from each of the four groups were weighed on 31st August, 1927, with the following results:—

	Average weight.
Lincoln-merino ewes (Wagga) Ryeland cross	40 lb.
„ „ „ Dorset Horn cross	43·6 lb.
Border Leicester-Merino ewes (Cowra) Ryeland cross ...	45·4 lb.
„ „ „ Dorset Horn cross ...	48·4 lb.

The Dorset Horn cross lambs looked bigger than the Ryeland cross, and also showed more bloom. The Dorset Horn lambs were inclined to be a little "leggy," and did not present such a compact, well fleshed carcase as the Ryeland lambs. A few lambs from the Wagga ewes had longer and coarser wool than the other lambs. The majority of the lambs of each cross were in good condition, sappy and vigorous, and there was only a small proportion of lambs that had lost bloom.—A. K. Cantrill, Sheep and Wool Instructor.

Pedigree Cereal Seed.

Methods of Production at Experiment Farms in New South Wales.

J. T. PRIDHAM, H.D.A., Plant Breeder.

In addition to the evolution of new and improved varieties of cereals by cross-breeding, the task of laying the foundation for pedigree seed of standard varieties also devolves considerably on the plant breeder. The plant breeder alone naturally has under observation small morphological differences between different varieties or different strains of the same variety, and it naturally falls to him to make the first selection of the individual plant, the seed of which is increased each year until it becomes the "pedigree" seed which is sold in bulk to farmers from the experiment farms.

Varieties of wheat in recent years seem to be more subject to natural crossing than formerly, and it becomes more essential that pedigree or pure line selection should be carried on, rather than mass selection to preserve the characteristics of the variety. Probably, as the result of this natural crossing more than anything else, the standard varieties of wheat when grown on large areas, and when harvested for seed on a large scale, begin to show variations from the standard type after a few years. Some of these departures from the original type may actually be so marked as to justify a new name. In fact, some well known varieties have been produced in recent years in New South Wales by selection of these type variations—*e.g.*, Hard Federation, Bena, &c.

In other cases the amount of morphological variation from the true or standard type may not be sufficient to demand a new name, but the harvesting of seed of such variations under commercial conditions, combined with further natural crossing between them, further accentuates the amount of variation shown eventually by a variety, until it becomes a comparatively heterogenous mixture.

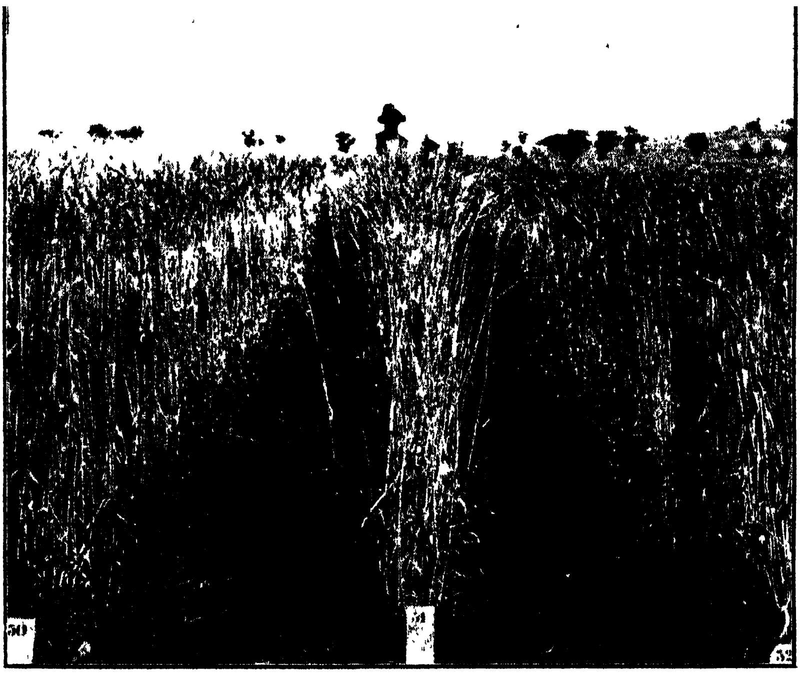
This is the condition of fields of wheat which have come under the observation of judges of field wheat competitions, in which the crop is assessed partly for purity and trueness to type. This item is rightly regarded as of importance, because the pure or pedigreed line of a variety has certain characteristics which make it adapted to certain environmental conditions, and the purer or more pedigreed a variety is the better it is likely to be in productive or yielding capacity under those conditions.

In the course of the work many plants of a variety are selected, and these are subjected to careful tests for yield, purity, type, and other characteristics, and after elimination of most of them from time to time the best pedigree strain is the only one retained. It is this strain that is increased for the supply of pedigree seed.

As many farmers are appreciating in recent years the value of purity in their cereal crops, it is thought that an account of the method of producing pedigree seed on the experiment farms under the control of the Department would be interesting. In particular, the methods followed at Cowra Experiment Farm are described, that being the main cereal breeding farm.

Methods Adopted at Cowra Experiment Farm.

The area utilised for the purpose on this farm comprises granite soil, varying from a stiff red to a free sandy loam, 21 acres in extent. It is



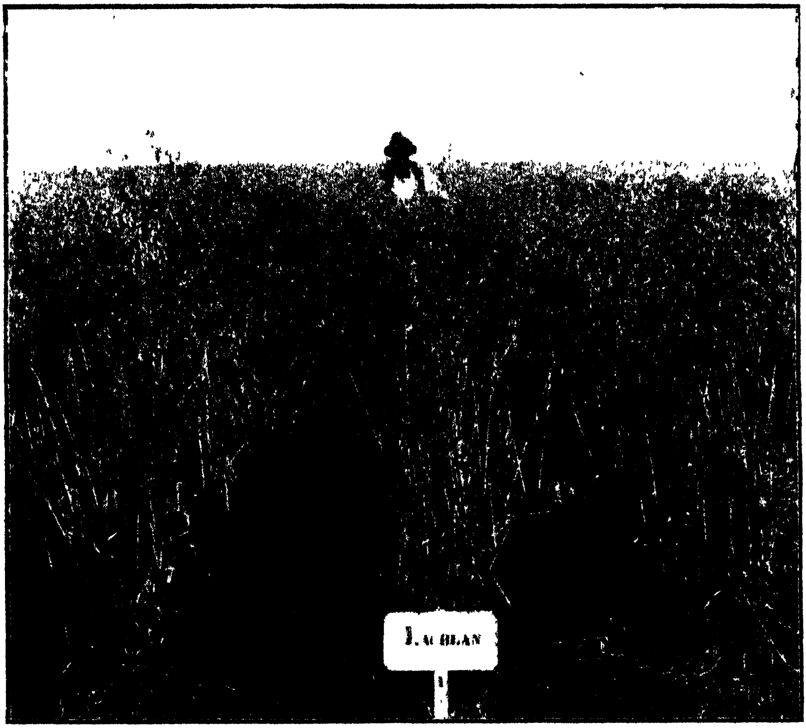
Stud Rows of Wheat at Cowra Experiment Farm.

divided into three seven-acre blocks with subdivision fences, so that they can be fed off with sheep, and a rotation of (1) wheat, (2) oats, (3) field peas is practised.

The field peas are usually sown in April in rows 30 to 36 inches apart, with 60 lb. superphosphate, at the rate of about 1 bushel per acre. They are cultivated with a two-horse cultivator of the Planet Junior type. and at flowering time sheep are turned in to clean up self-sown oats and weeds. After a final feeding off, the crop is ploughed in about September, and the ground kept clean till the end of April for wheat. Wheat sowing starts about the first week in May. The seven-acre area of wheat or oats consists of about 1½ acres of selected plants in 30-link rows, and 5½ acres of wide stud rows 4½ feet apart.

Selected Plant Rows.

This area is laid off in beds or sections, the standard length of row being 30 links, though some head-to-row plots are 15 links long. Paths 4 links wide intercept the beds. Each 30-link row is sown with seed of a single selected plant, the rows being spaced 2 links apart. A uniform sample of seed is sown by hand at the rate of fifty seeds to the row, single seeds being dropped about 4½ inches apart. A check or standard variety is sown in alternate rows. The plots are numbered consecutively, and the sections



Stud Rows of Oats at Cowra Exprriment Farm.

given a distinguishing letter, A, B, C, &c. At every tenth row a white-painted iron label is inserted showing the letter and number of such row. This enables one to find quickly any variety entered in the field note-book. This sowing of these short rows starts early in May and lasts to the end of the month or into June in some seasons. Long-season wheats are sown early, and quick-growing sorts last.

Sowings of oats, barley, and rye are also made in this area for breeding purposes.

These short rows are given no fertiliser, as the previous crop of peas leaves the soil in a good state of fertility, and the wheeled push hoe used for cultivation and weeding assists the growth of the plots. A point is

made of sowing all varieties of a given group or class on the same day, in order to have uniform conditions. Notes are taken during the growth of the plots, perhaps the most important being the date of heading out, which is a more reliable index of the earliness of the variety than the date of ripening, though that is also recorded. Observations on diseases and field defects or good points are noted, and two or three of the best yielding, vigorous, early plants are marked in each variety, and heads of these are bagged before flowering to ensure self-fertilisation and greater purity. A narrow strip of black print is tied just beneath the ear. This is usually done before the crop ripens off, because superior looking plants cannot be detected so well when the plot is quite ripe.

These selected plants provide the material for increase plots, and are harvested separately and tied in a bundle with row letter and number, name, and date of harvesting. The small bundles of "selected plants" are hung up under cover till there is time to thresh them. The remainder of the row is known as "selected bulk," and usually weighs 1 to 1½ lb. This constitutes the seed for the 6 to 10 chain rows described later. The 30-link rows are hand-reaped and tied to stakes in the field, and eventually are threshed there. Intermediate check plots are first cut out, and put up into stooks for threshing and weighing later.

The selected plants are threshed by putting them singly into a stout calico bag and beating out the grain on a block—no stick or flail is necessary. The contents are emptied into a tin basin, the chaff blown away, and the grain put into seed envelopes which record the plot number, name of variety, date of heading, and of harvesting. When grain is bagged a label with name and date is put inside the bag as well as outside.

Wide Stud Rows.

The wide stud rows are sown 4½ feet apart with selected bulk seed, and 56 to 60 lb. superphosphate. Using the ordinary seed drill, sowing is from every seventh seed chamber, the intermediate ones being shut off. In this way 1 lb. of seed will easily sow a row 10 chains long. For the sake of comparing varieties, those of similar season of maturity are sown alongside one another. These rows are 6 to 10 chains long, and if a variety is established and promising, several rows are sown, partly in order that a larger quantity of seed may be raised, and partly to guard against the risk of relying on a single mother plant, whose progeny (in the case of wheat) might become impure from natural crossing. Of newly fixed crossbreds or introduced sorts one row only is sown. A few rows of field peas are put in the oat section to provide seed for next year's sowings. It is usually found necessary to feed off the oats with sheep to reduce the length of straw for convenient harvesting.

A few rows of barley are also sown to supply the limited demand for that cereal. The seeding is done in May, usually in two divisions. The mid-season varieties are sown early in the month, and the earlier ripening sorts

about a fortnight later. Varieties resembling each other are grouped as far as possible. Cultivating is done when necessary to keep down weeds, and we rarely resort to feeding off with sheep.

For harvesting the long rows of selected bulks of wheat, oats, and barley, we employ a most useful machine designed by Mr. G. S. Gordon, of the Research Farm, Werribee, Victoria. It is a miniature stripper, consisting of a 3-foot drum with detachable grain box behind, mounted on a frame, with 1½ h.p. petrol engine at the rear; the whole is drawn by one horse. This machine does very satisfactory work. The grain, mixed with cavings and bits of straw, is emptied into bags, which are labelled and tied at the

A Special Stripper Harvesting Stud Seed Oats at Cowra Experiment Farm.

mouth. These are carted to a grain shed, and when harvest is over are cleaned with a "blower"—a winnowing machine without sieves. The very light and small grain is got rid of, though in such widely-spaced rows we get remarkably little of that. Such samples do not require grading and are handed over to the experimentalist or sent to other experiment farms as "stud" seed, which is sown to raise the "stud bulk" seed, which the farm manager in turn sows to produce "pedigree" seed for sale to farmers. With careful roguing during the season we find this system quite satisfactory. After stripping is done the machine is set up in the field and used for threshing small sheaves, which it does exceptionally well. Such samples as are wanted for sowing need further cleaning.

Pedigree Seed.

Every precaution is taken in the selected plant rows, by bagging the heads to ensure self-fertilisation, and in the stud rows by wide spacing, careful roguing, and careful harvesting and threshing, to avoid any admixture.

Stud bulk and pedigree seed are raised by sowing respectively stud and stud bulk seed at the rate of 50 to 60 lb. per acre with superphosphate at 60 lb. per acre. When the stud seed is of a variety sold to farmers and grown commercially on the farm, it is sown alongside the stud bulk of that variety with a track between or a buffer, which is cut for hay.

The newer varieties, or those not yet grown in large areas, are sown in plots ½ to 2 acres in extent, a buffer plot of hay being sown between each. The areas producing stud bulk seed are harvested with a stripper, and winnowed.

The standard varieties (stud and stud bulk seed being sown in adjacent plots) are harvested with a header, the stud seed being dealt with first. These areas are from 2 to 12 acres in extent. Afterwards the stud bulks are harvested.

The stud and stud bulk areas are carefully strangered, and much care is exercised in cleaning all machines used in connection with the grading as well as harvesting to ensure purity.

It will thus be seen that a farmer buying pedigree seed from the experiment farm is purchasing what is designed to be the produce of a pure line from a single plant selected for trueness to type and variety characteristics, kept pure and free from natural cross-fertilisation by bagging, wide spacing, roguing, and by careful seeding and harvesting to avoid admixture.

This production of pedigree seed of the standard varieties of wheat and other cereals on the main experiment farms is calculated to have an important influence on the wheat yields of the State, when it is considered that the demand for such seed by farmers catering for the larger pure seed business is already much greater than the supply.

Silage from Spoilt Hay.

At a recent meeting of the Singleton Sub-district Council of the Agricultural Bureau, Mr. L. C. Dodds, of Bulga, related an interesting experience in fodder conservation. Last January he had a large crop of lucerne, but rain drenched a considerable quantity of the hay. He therefore dug a pit of about 100 cubic yards capacity with the assistance of one man and the aid of a scoop, the work taking one day to perform, and into this pit he turned about 60 tons of green lucerne and hay, starting with a layer of green lucerne and alternating it with the spoilt hay. Water was added when filling and the weight of a draught horse was utilised to press the material down, while the covering consisted of fence rails and earth heaped on top of them. The silage was in perfect condition when opened in August, and was fed to milking and dry cows, which did well on it and ate it greedily. The crop would have been wasted but for the pit. Mr. Dodds estimated that he had conserved sufficient feed for forty head of cattle for three months.

Soil Drainage and Wheat Yields.

Some Observations on their Relations.

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

In the 1925 wheat-growing season some very high average yields were obtained on the south side of the Macquarie River in the Narromine district. The general average of the yields was much above the State or district average, and this occurred notwithstanding somewhat adverse seasonal conditions, especially during the spring months.

Of the 52,500 acres under crop, only 4,135 acres were sown on fallowed land, which averaged 21 bushels per acre, while the balance, on stubble, returned an average yield of over 15 bushels per acre. Much of the latter consisted of late sown crop on areas which had become waterlogged, with consequent poor germination results, and also of areas on heavy buddah and black soil plain country that gave comparatively poor returns. If these poor yielding areas were deducted from the total, the average yield of the greater percentage of the area would be lifted considerably.

The area under question lies to the west and south-west of the river and railway line, and it is this locality which it is proposed to bring under irrigation and water conservation for stock and domestic purposes, by means of the Burrendong dam and Macquarie Vale irrigation scheme.

Within this area individual yields up to 52 bushels per acre were experienced, and averages of from 8 to 12 bags were frequent, nearly all being on stubble land. Good rains, averaging over an inch, were recorded during May after a dry autumn, and this allowed April and May sown crops to germinate and stool well.

During June from 8 to 10 inches of rain were recorded between the 18th and 22nd, and this abnormally heavy rain apparently thoroughly saturated the soil and subsoil, but from inquiries made very few cases of waterlogging or of water lying about on the surface occurred. Up to 18th July small but frequent showers occurred, but from then on till 30th October the aggregate rainfall did not exceed 150 points at any centre, and it occurred in seven falls, the greatest being about 40 points.

Now in other localities around Dubbo, Guerie, Peak Hill, and Wellington, where equally good rains were recorded, with even heavier spring rains, a considerable amount of waterlogging occurred, germination was very patchy and growth spindly, and the ultimate yields were only fair to poor or partial failures.

I am inclined to the belief that the reason for success in the belt of country in the Narromine district is that adequate natural drainage is provided, and that all surplus water is carried away, leaving the soil (which is of a light reddish clay loamy nature, merging gradually at a depth of from 6 to 12 inches into an indefinite clay subsoil of somewhat granular formation) thoroughly saturated, but not containing any free

water. This allows of adequate aeration with retention of soil moisture, which in spite of the dry conditions was apparently sufficient to see the crops through to maturity.

From previous experience on the Murrumbidgee Irrigation Area, I am convinced that the factor of paramount importance in regard to growing crops for fodder or for grain under irrigation is good natural soil drainage, and in view of the possible extension of irrigation to the land under question in the Narromine district for the production of fodder reserves of cereal crops, lucerne, &c., to be used during periods of drought, I have thought fit to bring under notice the results obtained during this past year, under seasonal conditions which are quite comparable to the land having been irrigated during June.

Under a sound system of fallowing, and given a seasonable average rainfall during the fallowing period, it is reasonable to expect that this class of country should yield more than average returns, as was instanced by the increased average yield of 6 bushels per acre obtained in the 1925 season.

It is feasible that this belt of country, if brought under irrigation, would fully respond to minimum irrigation, combined with maximum cultivation, which (with small costs for water rights) would tend to make the growing of cereal crops for fodder production a profitable venture, without taking into consideration the economic side of the question.

Provided a soil, rich enough in humus content, has good retentive powers and porosity or high capillarity, the presence of good natural drainage has several advantages, namely:—

(1) Freedom from waterlogging, with its consequent poor germination results, due to bacterial inactivity.

(2) Thorough aeration of the soil, allowing increased availability of plant foods.

(3) The maintenance of good physical condition under irrigation practices.

(4) The soil may be worked more easily.

(5) Less time is lost, as the ground may be worked shortly after rains or irrigation.

(6) Crops are not inclined to make rank growth, lodge, and be difficult to harvest.

Instruction in Bee-keeping.

The Department has completed arrangements for holding the usual summer school in apiculture at Hawkesbury Agricultural College. The school will be run from 4th to 20th January, and will be open to applicants of either sex over sixteen years of age. A fee of £3 10s. (including board and lodging) will be charged for the course of instruction, which will cover all branches of practical work, and include a series of lectures dealing fully with the various aspects of bee-keeping.

Prospectus and application forms may be obtained from the Under Secretary, Department of Agriculture, Sydney, to whom all inquiries should be addressed.

Farmers' Field Days around Gunnedah.

SOME OF THE IMPRESSIONS GLEANED.

W. H. BROWN, Editor of Publications.

CROPS that promise to yield eight, nine, or even ten bags of wheat to the acre on rainfalls during the growing period ranging from 160 or 170 points to something less than 3 inches, were shown by members of the branches of the Agricultural Bureau in the Gunnedah district to one another during a series of Farmers' Field Days in the early part of October of the present year.

Failures abound in the district, unfortunately, and thousands of acres of wheat have had to be fed off because the crops would not mature payable grain. Yet here and there—and not insignificant in the total number—are crops that would have been reckoned good in a thoroughly favourable season, while there are a score or more where the cultural methods have been so sound that five, six, and seven bags would have been harvested had not the scarcity of feed compelled farmers to feed off the cereals so heavily as to seriously reduce the prospects of grain.

Such a season affords abundant and undeniable evidence that wheat-growing in the north-west is a reasonably assured proposition even under adverse conditions. It is a good while, perhaps, since anyone was bold enough to hazard that wheat cannot be grown in that part of the State, but there are still those who regard it as "risky." Their doubts should surely be set at rest by the logic of crops 3 feet high, promising yields of 25 to 30 bushels per acre, in a season when from sowing time till the middle of September the rainfall has been almost insignificant. And these are not small pockets in favoured positions. Farms on which 300 to 500 acres and more were sown will strip perhaps half and even more than half their areas for payable yields. Nor is the present season isolated in this respect, for in 1925, on a rainfall of a little over 3 inches during growth crops averaging six or eight bags per acre were harvested on many farms growing 300 and 400 acres of wheat. The plain fact is, providing sound cultural methods are adopted, the right varieties are grown, and seed of good quality is used, the north-west will grow wheat with very reasonable certainty of profit. Indeed, so true is this that the expansion of the industry is inevitable, for there are thousands of acres of land still under the native forest or partially cleared that smile fertility at the passer-by.

The series of Farmers' Field Days referred to above attracted as many as twenty-two cars on one day, and fourteen on another, and though the numbers on the other days were smaller, due to many farmers being busy hand-feeding stock or otherwise engaged owing to the adversity of the season, an undercurrent of interest was still manifest. The branches of the Bureau at Nea Siding and Carara, Mary's Mount, Basin Plain, Emerald Hill, Willala, Nobby Rock, and Dunadee Creek all exhibited the keenest

interest in the tour, and many cars took part for more than one day. Something like 100 people were present on the first day of the tour, and on this, as on the other days, luncheon was partaken of at pre-arranged points, whither the ladies had brought ample stocks of good things. Among those who followed the programme consistently was a small party of officers of the Department of Agriculture, including Mr. H. C. Stening, Chief Instructor, and Mr. McCauley, Agricultural Instructor for the district.

Long and Short Fallowing.

If one would know the secret of the excellent yields obtained on a number of farms, several factors must be taken into consideration. First, it must be pointed out that as the rainfall in the north-west is chiefly a summer one, it is possible to adopt a modification of the long fallowing system that a winter rainfall imposes upon Riverina farmers. In short, while the winter fallow is highly desirable as a means of controlling diseases, weeds, &c., and of allowing the soil to store up plant food, a short summer fallow consisting of the working of the soil immediately after harvest, can be made a regular feature of wheat-growing in the northern portion of the wheat belt. Hence, the up-to-date north-western farmer is usually found with one-third of his cultivation under winter fallow, one-third under wheat growing on land that was winter fallowed, and one-third under wheat on land that was short summer fallowed.

Which of these two systems is the better it is perhaps difficult to say, for the conditions of different seasons may favour either one or other, but speaking generally the long fallow is the safer practice. Out of four or five particularly fine crops in the Gunnedah district this year, two in particular were on long fallow. Mr. J. Cavanagh, with two blocks of Clarendon, each exceeding 120 acres, estimated to run nine to ten bags, and Mr. C. H. Beeson, with 80 acres of Duri, Bobin, and Waratah, the three varieties promising almost equally well, both had prepared their land by long fallow. On the other hand, the crops of Mr. Ivey at Carara (Hard Federation) and of Messrs. Clark Bros. at Willala (Waratah and Bena), promising almost if not quite as well, were both on short fallow.

The best farmers in the north-west consistently practice long fallow and short fallow alternately; "two years in and one year out," they say, and the results this year on the whole favour the long fallow. Messrs. L. Hathway and Son, Wood Bros., and J. Cavanagh may be numbered among these, but there are those who prefer short fallow because their interest in sheep is greater than in wheat, and they consider the loss of feed by long fallowing is not justified. Men like Messrs. A. Campbell and F. Foster in the Mary's Mount area fully realise the value of early preparation, however, and they start work in view of the next crop immediately harvest is over.

Mr. C. H. Beeson indicated the importance of getting things going early. He chiefly practises long fallow, but also utilises the shorter preparation. Last summer 527 points of rain fell in December with him, and the organisation of his farm was so complete that he was able to start the tractor at

work at once, and working long hours he had the whole of his wheat land for the next crop (both long and short fallow) in good condition within a week or two. When it is remembered that 242 points of rain also fell in January, and 329 points in April, and that the rainfall during the growing period on this farm was only 184 points, it is manifest that it is the summer rains conserved by the summer working that have been responsible for the expectation of crops of seven or eight to ten bags per acre over the whole farm.

The Soils of the District.

The wheat soils of the north-west occur chiefly in ridges that lie to the east and west of the main line of railway. They consist mainly of red to chocolate loams, with numerous outcrops of gravel. To the north of Gunnedah and in a few other localities a light grey sandy loam occurs.

These various soils are all of good fertility and capable of retaining moisture well, and they require rather different treatment from heavier soils. On account of their freer working nature, the necessity for a cloddy surface does not occupy the attention of farmers.

The lighter red soils must be worked with care, however, for it is necessary to ensure a compact seed-bed. This means that the ploughing for a long fallow may be deep (it should, in fact, be 3 or 4 or even 5 inches deep) because time is then allowed for rain, cultivating implements, and sheep to reduce the worked soil to a close contact with the subsoil. With several of the best farmers in the Gunnedah district this is a cardinal principle, and their crops this season advertise the soundness of their methods. On the other hand, when these lighter soils are being worked up for the short fallow referred to above, only shallow cultivation must be practised, otherwise the contact of the surface soil with the subsoil will be disturbed and a loose seed bed be obtained in which the crop will usually make but poor growth. Hence, while the mouldboard plough is preferred for the first working on the long fallow, implements like the spring-tooth cultivator, disc cultivator, or rigid tine cultivator are more suitable for the first operation on short summer fallow. Wood Bros. especially attached importance to the compacting of the seed-bed; they stated that after working winter fallow to the full ploughing depth with the springtooth cultivator for the first time, they use the same implement for a shallower working and attach a harrow to it to pack the soil.

The handling of the deep chocolate loams has to be quite different. The compacting of surface and subsoil proceeds but slowly on such land, and deep ploughing is therefore unsatisfactory, even in the case of long fallowing. The self-mulching character of these soils allows the working to be of the lightest, and though they demand judgment they can be inexpensively prepared.

The Place of Superphosphate.

It needs no enlargement that superphosphate has but a small place in wheat-growing in the north-west. For long the results of the trials seemed to be definitely against it, but latterly a few farmers have been using it

with advantage on light soils. Mr. W. Manning at Curlewis applied 40 lb. of high-grade superphosphate on experiment plots and on ordinary farm crops last April, and the marked difference in the growth where the manure drill missed was sufficient proof of its value on his farm. Even where a crop had been eaten right out, the difference in the number of roots remaining on manured and unmanured areas could be plainly seen. Not far away Messrs. Wood Bros. used superphosphate on several areas, and with an advantage of quite 3 bushels on a pure seed plot of Hard Federation. A crop of Waratah manured with 40 lb. superphosphate showed a marked difference over an unmanured area, and the remark was made that the difference was even greater before the rain of a week previous. Messrs. Wood Bros. stated that they valued this fertiliser especially for the increased straw it produced, and the consequently better "burn" they got after harvest.

Pure Seed and the Right Varieties.

Another essential to good results in this part of the State is good seed. It is of no less importance, of course, throughout the whole of the wheat areas, but it is only within quite recent years that its importance has really come home to farmers here. Not long ago, varieties like Steinwedel, Federation, Cumberland, &c., were common, but to-day Waratah, Canberra, Hard Federation, and Clarendon all have their followers, and such varieties as Early Bird, Bobin, Currawa, Aussie, and Gluyas Early are being grown on quite a number of farms. Moreover, there is keen interest in the behaviour of different varieties on different soils, and it is realised that close attention in this matter is essential. For instance, Mr. C. H. Beeson at Normanstone Well finds Early Bird one of his best varieties, while Mr. J. W. McDonald, at Emerald Hill, does not find it satisfactory at all. Per contra, Mr. McDonald does well with Aussie, and so does Mr. L. Pryor, away north of Gunnedah on a quite different class of soil, but Mr. Beeson gets only disappointing results from it.

The quality and purity of the seed is another factor that is now appreciated. To this the Department has certainly been a notable contributor. The practice of supplying limited parcels of pure seed to various branches of the Bureau for the purpose of the production of seed for the use of members directed a great deal of attention to the matter of quality in itself. Several illustrations could be quoted, but an outstanding one of the tour round Gunnedah was afforded on the farm of Messrs. Stanger Bros. Nine years ago they obtained seed of Hard Federation from Cowra Experiment Farm and they have consistently grown from that strain ever since; but last season they procured another parcel of the same variety from the same farm. This year the two were to be seen growing alongside one another, and the advantage of the recent introduction was most apparent. Other cases could be quoted, for many pure seed plots are to be seen now in the north-west, and wherever comparisons can be made farmers are impressed with the importance of having the best seed obtainable.

The depth at which the seed is sown is also a point to which good farmers give attention. If the moisture is fairly deep, then the seed should be planted well down on it, even to 3 inches deep, but where the seed bed is dry it is well to sow as near the surface as possible. Two plots were pointed out on one farm, on one of which the seed had been planted fairly deep on the moisture, while on the other it had been sown quite shallow, though there was moisture a bit below. The first crop was well headed, dense, and even, and probably three weeks earlier than the other, which was not nearly so attractive to the eye. One would probably yield eight bags and the other six. Mr. Ivey, at Carara, related that he started sowing 2 inches deep—just enough to place the seed on the moisture, and as the work went on and the soil became drier he made his planting a bit deeper.

The quantity of seed used per acre varies considerably. At the Curlewis end of the district from 37 lb. to 45 lb. was chiefly used this season, but further west the sowing was rather heavier, and on the northern side of Gunnedah 65 lb. to 70 lb. was employed by Mr. L. Pryor for a crop of Clarendon.

The Value of Sheep—and of Oats.

A factor of much value on the wheat farm is a flock of sheep. Not only do they turn the stubble and the weed growth on fallows to account, but they help to compact the soil, and can sometimes be used with advantage to check a too forward crop. In the present season many crops have been fed right off, of course, but on many more feeding off has greatly reduced the yield. Feeding off should be limited to the early growth of a crop, but when pastures are failing for want of rain, choice must be made between the sheep and the crop, and generally the choice is in favour of the former. What is most interesting, however, is that, though the rainfall during growth in a few places reached 3 inches, and in many places did not reach 2 inches, grazing has been obtained for two, three, and even four weeks, and yet crops of three and four and even five bags of grain will be harvested.

These facts should turn farmers to the question—"Is there any other crop that will provide the same or more grazing, and will enable the wheat to be harvested to the best advantage?"

To that question the Department of Agriculture has an answer—it is the one word, "Oats." As Mr. J. T. Pridham (who has done so much with oats in this State, and who was himself of the party that visited Gunnedah) told several farmers: "Oats are a better crop for feeding off because they give a greater bulk of feed of better quality." And experience is beginning to confirm this with many farmers in the Gunnedah section.

Messrs. Wood Bros. at Curlewis, for instance, had 30 acres of Mulga this year, on which they fed 400 ewes for one month and also ran twenty-three horses at intervals; the stock were removed for five weeks and were then turned on again, and the large stock have been there intermittently ever since; early in October, following rain during the last week in September, there was again a nice shoot. Mr. J. Cavanagh had a series of experiment

plots with this cereal, which had been sown at the rate of 1 bushel per acre on 22nd April after a short fallow. The plots were fed off twice and rolled between, and early in October they presented a most attractive appearance. Buddah was the earliest variety of all, but Myall and Mulga were not far behind, and Guyra was still green enough to promise good development. Messrs. Stanger Bros. pointed out a pure seed plot of about 3 acres of Mulga on which they shepherded 70 sheep per acre for one week in June, and a little later the same sheep again for two days; yet a yield of nine to ten bags of grain was expected at the time of the inspection. Not far away the same farmers had 22 acres of the same variety, on which they lambed 120 ewes, grazing them over it for some six weeks, and also ran twenty head of draughts every night, four milking cows, and nine poddies. In October the large stock were still on this crop, which had been well worth sowing for its grazing alone.

"I'd always have a bit of oats now, especially for feeding off for sheep," said Mr. C. Boyer as the party walked away from oat variety plots on his farm at Wynella. Belar, Mulga, and Gidgee in that order were the best looking at this centre, but the crop had made an impression upon him as feed that he will not forget.

Think of those facts, farmers of the north-west who have had to feed off wheat this year! On rainfalls of 2 to 3 inches during growth, a cereal supplies weeks of grazing for the sheep and larger stock, does it at a minimum of cost, and in greater abundance than wheat. Sow a few acres ahead of your wheat next year, and see if it is not so. The plots in your district will indicate the best variety for your conditions!

Silage as a Stand-by.

Even with oats, however, it is possible for a farmer to be short of feed for his stock, and conserved fodder in some form is essential. Around Gunnedah an interest was found in the subject of the conservation of oats in small grain silos, and it will not be long before progressive farmers in the district will be following the example of some of the Riverina and central-western men in this respect.

Several farmers were able to tell the immense advantage silage had been to them in the long dry spell that they hope is now ended.

Messrs. L. Hathway and Son conserved 200 tons of oaten silage in August, 1926, in one paddock on their farm at Curlewis and 120 tons in another pit some distance away. They had scooped out a depression about 2 feet 6 inches deep, hauled the oats in, and stacked them in sheaf until about 6 feet above soil level, finally covering the whole in with soil. The pit has now sunk to a total depth of about 4 ft. 6 in. and the sample of silage is a capital one, though some loss occurred where the oats were not completely covered and where sheep had got at the stack and pulled the cover away. On this reserve a flock of 500 sheep was fed for sixteen weeks, while 300 ewes were lambed in a 90-acre paddock, where they were fed silage. Not a

ewe was lost, and 93 per cent. of lambs were marked. The lambs were topped off on oat and wheat crops, and were also fed a little grain. They were eventually trucked to Homebush and sold at up to 22s. 7d., averaging 19s. 10d., and as there was still no likelihood of shortage of feed, another line of sheep was bought in at 9s.

Messrs. Norrie Bros., members of Mary's Mount branch, last year ensiled about 200 tons of feed from 50 acres of wild oats and self-sown wheat. The pit, which is 60 feet long by 24 feet wide at the top and 24 feet by 18 feet on the bottom, was sunk in a week and filled as convenient during a period of two months, after which it was covered with soil, and to-day, though portion has been fed out, the silage is of the finest quality, containing all the natural succulence and feeding value.

Mr. L. Pryor, of the Nobby Rock branch of the Bureau, last year conserved 200 tons of Skinless barley in an old gravel pit on his farm, and now has silage of excellent quality. Originally it was stacked 13 feet high, but has settled until now it gives a cutting face of 6 to 7 feet. This fodder has been in use ever since February, sufficient being carted out daily for the sheep to just clean up. For some time 400 sheep were fed in this way, and though the material had cost no more than 2s. to store, 35 tons of it have been sold at £2 10s. per ton, and there are still 80 to 90 tons on hand.

What, it may be asked, would these farmers have done without these reserves which foresight had provided them with? If in one sense the commercial result can be worked out, there has been a profit that no calculation can put a value on.

It is only a few of the outstanding impressions that it has been possible to discuss in the foregoing paragraphs. There was much more most interesting and valuable material available, but it might perhaps be summarised by the remark that the progressive farmers are the successful ones, and that the man who would be numbered among the latter will find the company of the former well worth cultivating. Hence the Department's advice to farmers in that districts is: Join the Agricultural Bureau! To the many who generously afforded information and help the thanks of the officers of the Department are cordially tendered.

Top-dressing Old Cultivated Land.

THE practice of top-dressing old cultivated land that has been temporarily left out of the cropping areas is proving beneficial, in that more stock are able to be grazed on the land and that those stock are kept in better health and development. As an instance, four fields were top-dressed with 1 cwt. of 45 per cent. superphosphate per acre during June, 1926, and although they were not fully grazed and were still carrying a lot of feed on 31st March, the fields had by that time carried 1.47 sheep per acre for the year—quite half a sheep per acre better than for the previous season when they had been full grazed.—L. J. COOK, in the South Australian *Journal of Agriculture.*

A Concrete Water Tank.

N. L. JONES, Supervising Architect.

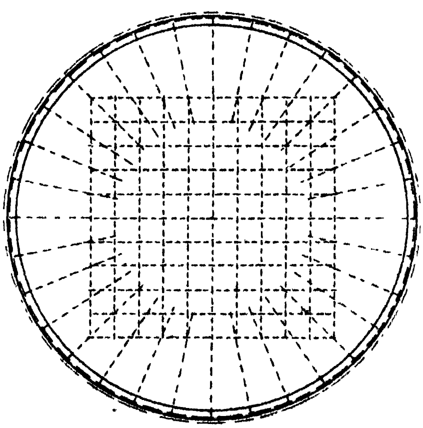
NUMEROUS applications reach the Department for plans and specifications of a concrete tank capable of containing a reasonable quantity of water. The accompanying plans provide for a circular tank with a capacity of 10,000 gallons, the diameter being 16 feet, and the walls 8 feet high and 5 inches thick.

The materials required for the construction of such a tank are:—

Cement	2¼ tons.
Sand	6¼ cubic yards.
Metal	10 ,,
⅜ in. diameter deformed steel	64 15-ft. lengths, 16 8-ft. lengths, and 32 5-ft. lengths. Total weight, 4¼ cwt.
No. 8 fence wire...	22 10-ft. lengths. Total weight, 17 lb.

Use Good Materials.

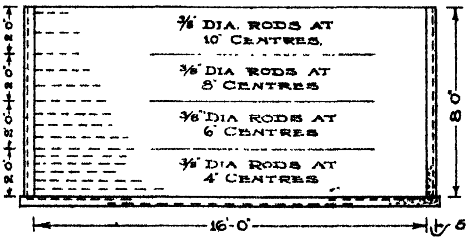
The cement should preferably carry a Government test certificate, and the sand should be clean and sharp, and free from vegetable matter. The metal should be of a hard stone, such as blue metal, and sandstone or similar soft stones should be avoided if possible. The metal should be broken and uniformly graded between ½-inch and 2-inch sizes.



Ground Plan of Concrete Tank.

The concrete should be composed of one part cement, three parts sand, and six of metal. It should be mixed on a wooden or other suitable platform, turned twice in a dry state, and twice while water is being added, and it should be placed in position immediately it is mixed and thoroughly tamped in and around the reinforcements.

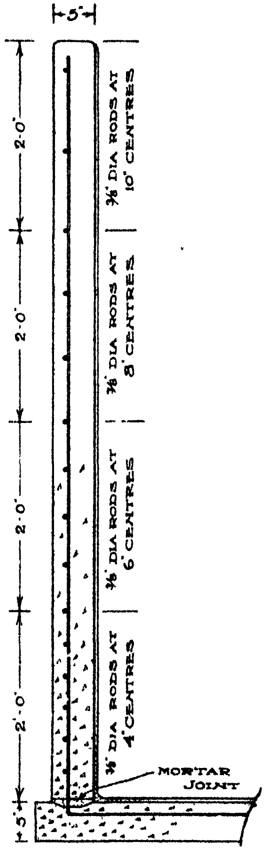
The cement mortar should consist of one part cement to two parts sand, and should be mixed in small batches, used immediately it is mixed, and protected with bags or the like from sun, frost, and wind after it has been spread.



Cross Section of Tank.

Putting Down the Floor.

Construction should commence with the clearing of a foundation by stripping the turf off the selected area, and grading carefully to obtain a perfectly level and even surface. The floor will consist of a bed of concrete 5 inches thick. Just within the outer edge, where the tank wall will rest, a V-shaped depression should be formed by removing the wet concrete to provide a key for the mortar joint. The floor will require to be reinforced, and twenty-two 10-feet lengths of No. 8 fencing wire may be laid at right angles to each other, so as to form 12-inch square meshes. For the outer edge of the floor, a further reinforcement should be provided, consisting of thirty-two 5-feet lengths of $\frac{3}{8}$-inch steel rod, which should be laid pointing towards the centre.



Detail Section of Wall.

Construction of Walls.

The walls should also be 5 inches thick, bonded to the tank floor with a bed of cement mortar, not less than ½ inch thick, such bonding to be carefully placed before the concrete is poured over it, to prevent leakage at this point.

The construction of the wall should be carried out by means of forms, which should be of such solid construction that they will not yield under the pressure of tamping. Nor should they be removed from the poured concrete until the latter has set sufficiently to withstand the strain of fixing the forms for the next lift.

The walls will require to be reinforced with ⅜-inch steel rods, lashed to vertical rods of the same material, and lapped not less than 18 inches at the ends. The ends of each horizontal rod must be hooked.

Immediately the wall or ring is cast, the whole of the interior should be rendered ½ inch thick with cement mortar, which should be floated and trowelled to a smooth surface, the angle at floor and wall being cupped. This work should be commenced and completed the same day, and protected with a suitable covering as mentioned above. All rendering must be done while the concrete is still "green."

The exterior of the wall need not be rendered, but all holes should be pointed up and worked with a wood float while the concrete is "green."

Bonding New and Old Concrete.

It may happen that during the construction of the walls of the tank the work has to be temporarily abandoned for one reason or another. In such cases we are confronted with the question of bonding the new concrete with the older concrete that has set during the stoppage of work. To make a good junction between the old and new concrete it will be necessary, first, to scrape and sweep off all loose particles and dust, thoroughly soak the old concrete with water, and then apply a bed of cement mortar ⅜-inch thick on the old concrete, immediately before the new concrete is placed. This will obviate leakages, which are almost sure to occur if this precaution is not adopted. The ideal, of course, is to pour the whole of the concrete in one operation, but this is hardly practicable in most cases.

"Forest Insects and Timber Borers"

This work, by Mr. W. W. Froggatt, may be regarded as a continuation of "Forest Insects of Australia" by the same author. It consists mainly of a series of papers that have already been published in the *Australian Forestry Journal,* illustrating the work on which Mr. Froggatt was engaged during the latter part of his labours as special forest entomologist to the Forestry Commission of New South Wales.

First hand experience of the handling of timber has convinced this author that the problems of protection of these valuable products from the depredations of insect pests are not insurmountable—indeed, they are already solved, and Mr. Froggatt regards the solutions as quite commercially practicable. The interest that is now taken in re-afforestation is likely to be attended by an increase rather than a decrease of infestations, and the work that has been done in New South Wales in the last few years is, therefore, of the greatest importance and value.

Over fifty species are dealt with in this work, notes on their life histories and habits, brief descriptions of each species, and accounts of the damage done being presented. The book is well illustrated with line drawings by Miss E. A. King, and should be a most useful introduction for future workers.

Published by the Government Printer, Sydney.

Field Experiments with Maize.

GRAFTON EXPERIMENT FARM.

R. J. DAVIDSON, Experimentalist, Grafton Experiment Farm.

Time of Ploughing for Early Maize.

THIS experiment was continued during the past season. The object is to ascertain the effect on yield of ploughing in April, in June, and in August for maize sown in late August or early September. The plots were located on the same site as in the previous year, on black alluvial soil.

A good rainfall was experienced from April until the middle of July, and the initial ploughing of the April and June ploughed plots was performed under satisfactory conditions. Dry weather followed and prevailed until December. The entire rainfall consisted of light showers, and was hopelessly inadequate. The August-ploughed plot, when worked up, was dry.

The plots were planted on 1st September. Germination was slow and unsatisfactory, and the young crop was considerably damaged by cutworms. The whole of the experiment was disc cultivated and replanted, but with no better results. The dry spell eventually broke on 7th December, and enabled a successful planting to be made.

The incidence of the rainfall was as follows:—

	Points.		Points.
April (from 10th)	37	November	Nil
May	301	December	760
June	227	January	1,363
July	115	February	56
August	72	March	321
September	61	April	334
October	76	May	Nil

Plots 1 and 4 (checks) were ploughed on 10th April and harrowed on 28th July.

Plot 2 was ploughed on 11th June and harrowed on 28th July.

Plots 1, 2, 3, and 4 were ploughed on 12th August, rolled and harrowed on 23rd August, harrowed on 30th August.

Leaming variety was planted with a maize-dropper on 7th December, three grains every 32 inches, in rows 4 feet apart. No fertiliser was used. Abundant moisture and high temperatures resulted in a good germination, and promoted rapid and vigorous growth, apparently equal in all plots.

The growing crop was rolled and harrowed on 24th December, inter-row cultivated on 29th December, disc-hilled on 12th January, and the middles cultivated on 3rd February. The weather during growth was warm, with frequent showers until the grain was well set, and from then till maturity conditions were most favourable for the ripening of the grain and for harvesting.

Harvesting was carried out on 11th and 13th June with the following results:—

Treatment in order of merit.	Yield per acre based on percentage.		Decrease.		Value of decrease.	Less cost, extra cultivation.	Nett loss.
	bus.	lb.	bus.	lb.	£ s. d.	£ s. d.	£ s. d.
1. April ploughed	104	44	...		Average of checks.		
2. June ploughed	91	15	12	29	3 3 1	Nil	3 3 1
3. August ploughed	90	35	14	8	3 6 0	0 11 6	2 14 6

Valuations:—Maize, 4s. 8d. per bus.; second ploughing, 10s. per acre; harrowing, 1s. 6d. per acre.

The April-ploughed plot showed a substantial increase in yield and profit over the others. Between the June and August ploughed plots there was a difference of only 35 lb., which was in favour of the former. The comparatively favourable yield of the August-ploughed plot may be attributed to the four months' fallow which it received as a result of delayed seeding, and to the excellent season which followed.

The greater financial loss on the June-ploughed plot was due to the extra harrowing in July and second ploughing in August, which, as the season turned out, served no useful purpose, and simply incurred unnecessary expense.

Autumn Top-dressing of Irrigable Pasture

Although top-dressing lucerne with superphosphate has for some time been a definite part of the farm operations at Yanco Experiment Farm, the practice has in recent years been extended to include pastures. With the object of providing late winter and early spring feed for the dairy herd, the cow paddocks, which had only a very thin stand of lucerne, were top-dressed with superphosphate at the rate of 200 lb. per acre in the autumn (April).

From May to mid-August only 3½ inches of rain fell—nearly 6 inches fell in the same period last year—and yet periodical light grazings were obtained, the lucerne providing the bulk of the feed. On 18th August the paddocks received the first irrigation since top-dressing, and the natural plant growth, chiefly trefoil, that resulted was phenomenal. The rapidity with which the growth came away can be imagined from the fact that the paddocks were fit to graze on 5th September; one paddock of 3 acres carried twenty-two milking cows for a period of seven days, and it was not then completely eaten out.

These results indicate the possibility of obtaining a growth of natural pasture in early spring by the top-dressing of irrigable paddocks in the autumn, more especially in years such as the present one, when a low winter rainfall is recorded and suitable grazing for milking cows is scarce.—A. C. Orman, Experimentalist, Yanco Experiment Farm.

Farm Forestry.

II. Principles of Tree Planting.

R. H. ANDERSON, B.Sc.(Agr.), Botanic Gardens, Sydney.

Tree planting is not a haphazard operation, but is subject to certain definite rules and considerations. An understanding of the main factors governing the growth, vigour, and distribution of trees is a necessary requirement. Tree growth is influenced by the countless and varied processes which affect all living matter, but the chief factors may be grouped under the following headings:—(1) Climate; (2) soil; (3) density of stand or planting.

Climate.

Climate is the primary governing factor limiting tree growth. It is a wide term, embracing many factors, the principal being rainfall, temperature, altitude, and degree of wind experienced. In considering the effect of rainfall 3 points must be taken into account, viz., the total average annual rainfall, the minimum annual rainfall, and the nature of its distribution throughout the year.

In New South Wales the average annual rainfall varies from 10 inches at Broken Hill to 64 inches at Kiandra, and there is a corresponding adaptation of tree life to meet the needs of the locality. The *minimum* rainfall experienced in a given district is frequently a more important condition in tree-planting work than the average rainfall. In ordinary crop production a severe drought at the worst only results in the loss of the growth of one or two years, but in forestry work a similar drought may cause the destruction of trees which have taken many years to reach their present stage of development. Some tree species prefer a winter rainfall, while others do best where the rainfall comes mainly during the summer months.

Temperature also limits tree life to a marked extent, the wide range of temperature of the western plains imposing very severe restrictions on plant growth. The snow or white gum (*Eucalyptus coriacea*) grows on the bleak, cold plateaux of the dividing ranges, while many species will only flourish in the warm, sheltered, coastal gullies.

The degree of frost to be expected is another important consideration, as many species are peculiarly susceptible to frost injury. The main damage is done in the young stages of growth, particularly to seedlings, and species otherwise suitable for certain districts where fairly heavy frosts occur cannot be grown successfully unless given special protection. Frosts also affect older trees by freezing the ground and making the soil moisture unavailable, so that a condition similar to drought is established. This condition, however, is rare under New South Wales conditions.

Many species show a decided preference for a certain range in elevation, and will not descend, or ascend, as the case may be, below or above a certain altitude. Many of the tableland species do not descend to the coastal areas, and similarly the coastal species generally show a reluctance to ascend above a given contour line. The effect of elevation merely as a physical factor is probably small, but it is intimately associated with other influences such as temperature, exposure, &c., from which it is difficult to separate.

The degree of wind experienced has a limiting effect on tree growth, and places subject to high winds do not provide optimum conditions for arboreal development. Apart from the direct damage done in breaking or uprooting trees, the available moisture supply is depleted by evaporation and transpiration. Surface rooting species are particularly liable to damage. Some species, however, are able to make comparatively good development, although subject to high and frequent wind. The Norfolk Island Pine, which is deservedly popular for beach and coastal planting, stands a good deal of wind exposure.

Soil.

Soil conditions must be regarded from both chemical and physical standpoints. As mentioned in a previous article, a chemically rich soil is not an essential for tree growth, although certain species will not reach their best development except on rich fertile soils. Very little mineral matter is removed in the wood itself, and provided the leaf litter is returned to the soil, the growth of trees demands comparatively little mineral substance from the soil. Certain species flourish equally well on drift sands and rich volcanic soils, but other species demand a more uniform type of soil of moderate fertility. Speaking generally then, although a chemically poor soil will not grow *every* type of tree, yet there are few soils which, by reason of their chemical poverties, will not grow *some* type of tree.

Some species show a decided preference for certain geological formations; the Turpentine (*Syncarpia laurifolia*) is practically restricted to the Wianamatta shale, and there is a close correlation between the range of many other species and soil types.

The physical character of the soil is, however, a much more important factor. Thin, rocky soils will not grow good trees, and a fair depth of soil is necessary for proper development. Apart from depth, the main considerations from a physical standpoint are texture, aeration, moisture content, and nature of the subsoil. Some species demand a loose, porous soil, others a friable loam, while a third class reach their best development on heavy clays. Few species will thrive on a poorly drained or wet soil, but even on these soils certain species, such as swamp oak (*Casuarina glauca*), swamp mahogany (*Eucalyptus robusta*), and some of the tea-trees or paper-barks find their natural habitat. A wet, cold soil, however, considerably restricts the choice of species.

Generally speaking, the majority of tree species show a decided preference for a certain set of conditions, both of a climatic and soil character. In studying the naturally occurring trees of any species it is usually found

that the species demands certain conditions for its development, and when these conditions cease to obtain, the species then gives place to another one which is better suited to the changed environment. A study, therefore, of the distribution of any tree species is valuable in so far as it gives us information about the requirements of the species, and such information can form the basis of a selection of species for tree-planting work.

It must be remembered, however, that naturally grown trees are subject to certain limiting factors which are not present in the case of artificially grown trees. In the first place, there is a fierce competition with other species which restricts development to a certain area. If all competition were removed, the area of growth might be considerably extended. Secondly,

A 10-acre Plantation of Kurrajongs at Mungeribar.
The trees were planted as 6-inch seedlings in 1916 and 1917. No artificial watering has been done at any time, but the area is cultivated every second year.

the means of distribution of seed of a species might not be sufficiently well developed to allow its extension to districts other than those in the immediate vicinity. Lastly, the species is exposed to all the dangers of its environment from the very commencement of its growth, and receives no assistance in the way of preparation of the ground, cultivation, and protection. Under artificial conditions competition is removed, distribution secured by outside agencies, and by raising the plant in a nursery it receives special care and attention which tides it over the most critical period of development and adapts it for conditions that it could not possibly survive during the first few months of growth from seed.

A tree species, if artificially raised and planted, may show its suitability for conditions distinct from those of its natural habitat, and it does not follow that because a tree does not occur naturally under certain conditions it is not suited for those conditions if planted artificially. For instance, the white cedar (*Melia Azedarach*) and the silky oak (*Grevillea robusta*) are limited in their natural distribution to the brush and rain-forests of the North Coast and Queensland, where rainfall is heavy and conditions suitable for tropical species. Artificially, however, both these species can be grown successfully on the western slopes and plains, where conditions of rainfall, temperature, &c., are very different from those of their natural habitat. The red gum (*Eucalyptus rostrata*) is limited in its distribution to along the banks of inland rivers and to flats subject to inundations. One would, therefore, naturally expect it to thrive only on fairly moist soils along streams, or where there is permanent subsoil moisture. In artificially grown trees in South Africa, however, experience has shown that this species can resist drought, and does comparatively well on dry soils.

The exact limitation of a species for artificial planting, therefore, can only be ascertained if grown experimentally over a wide area. Such work, however, is necessarily difficult and slow to produce results, and in its absence the limitation and range of a species under natural conditions should be taken as a guide to its soil and climatic requirements.

Density of Stand.

Under ordinary forest conditions it may be noticed that trees growing close together tend to develop tall, straight stems and few lateral branches. On the other hand, trees growing in the open and with unrestricted freedom tend to branch fairly close to the ground and develop a much branched habit with many laterals. The general appearance of the tree is completely altered by the degree of its association with other trees, and its use is likewise modified. The development of lateral branches means knotty and crooked timber, so that the man requiring straight, clean timber must seek it where the trees grow in dense stands. On the other hand, the person requiring an ornamental tree, or a tree offering the maximum amount of shade and shelter, will allow it unrestricted development.

The shape and habit of a tree, together with the uses to which it may be put, depend primarily on the degree of its association with other trees. In the northern brushes the brush box (*Tristania conferta*) in competition with other trees develops a long, clean stem with lofty crown. When planted out in the streets about Sydney, and in response to the new conditions of unrestricted freedom and lateral development, it assumes a totally different appearance.

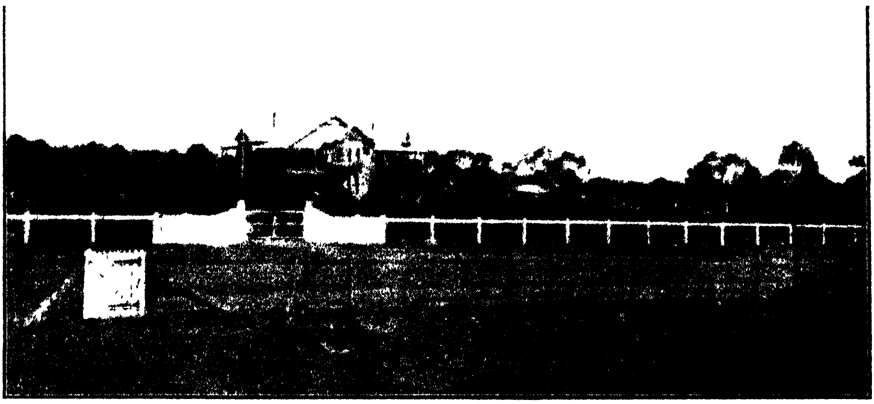
The light requirements of trees also differ considerably, some species growing under conditions of semi-shade, while others are light-demanding species, and require full light for their proper development.

Considerations in Tree-planting Work.

The general influence of climate and soil upon tree distribution outlined above must be taken into consideration when any planting is carried out, and practically governs the choice of species and sites.

Plantings on farm and pastoral areas may be grouped under any one of the following headings:—

1. Cases where a tree is required to develop fully and freely, no restriction being placed on lateral development or branching habit, *e.g.*, shade and shelter trees, ornamental trees, fodder trees.
2. Windbreaks and shelter belts, where the object is to produce uniform and good lateral development as a barrier against wind.
3. Plantings for timber and fuel for domestic use.
4. Plantings for profit.



Mungeribar House and its Surroundings.
Tree planting has transformed it into one of the most refreshing spots on the Western Line.

The success of any planting carried out will depend primarily on the care exercised in choice of species, preparation of the ground, planting, protection, and subsequent care of the trees.

Choice of Species.

The selection of the right species is the foundation of all tree-planting work, and the landowner cannot exercise too much care in this matter. A mistake in selection is disastrous, especially as the early growth of a tree is no sure indication of its suitability for the locality. A tree may flourish for a number of years and then gradually die off.

In ordinary agricultural practice a mistaken selection in a wheat or oats variety will only result in the loss of one year's crop, but in forestry work a mistaken selection may result in the loss of many years' work. Except in the case of isolated trees or ornamental trees, the landowner cannot afford to experiment, and should limit his choice to those species the success of which in his locality has been proved or is well assured.

What considerations guide the choice of species? The main points for consideration are:—

1. *Purpose of Planting.*—A tree may be eminently suitable for shade and shelter work, but worthless or practically so for timber production, *e.g.*, *Eucalyptus Macarthuri*, the Camden woolly butt, is a fine shade and ornamental tree, but its timber is of little use. On the other hand, many timber trees give poor shade and are not suitable for shelter purposes. If trees are planted for shade, their use should be restricted to that purpose, and they should not be regarded as a source of fuel and timber. Fodder trees afford useful shade and shelter, but provision should be made for other trees as well, for when lopped during drought they cease to function as shade trees, and this at a time when shelter is most urgently required.

In making a choice, then, emphasis must be laid on the main purpose of planting, and a species chosen which fills the requirements of one particular purpose, rather than a species which has general attractiveness but no particular merit. At the same time, some trees may serve a dual purpose, combining such features as shelter and ornament, and tree lots may also serve as useful shelters and windbreaks. A six-row windbreak may also be made to supply a regular yield of firewood without damaging its efficiency as a break.

2. *Suitability of the Species to the Conditions of the Planting Site.*—Generally speaking, this implies a consideration of the local climatic and soil conditions, the main features of which have been previously described. In considering climatic conditions it must be remembered that it is the extremes of temperature, rainfall, wind exposure, &c., that really matter, and the species selected must be sufficiently hardy to survive the worst that can be expected. Soil and subsoil conditions must be noted, and only those species planted which have demonstrated their capacity for thriving in such a medium. Conditions of the planting site in many cases will eliminate from choice many species otherwise eminently suitable.

3. *Hardiness and resistance to disease and insect attack.*—The species selected should not be liable to uncontrollable damage by insects and fungi, and as the farmer can afford to devote very little time to controlling insect and fungous pests on his trees, any species very liable to attack should be rejected. In coastal areas the pittosporum is useful for windbreak formations and shelter work, but in many districts it is so liable to the white wax scale that its planting can hardly be recommended. In the case of ornamental trees which receive special attention, liability to attack is not necessarily a bar to selection, as the trees can be treated with the ordinary control methods.

4. *Rapidity of Growth and Longevity.*—Generally speaking, the farmer or pastoralist requires only species which are fast growing, as he wants quick results and cannot afford to wait many years for development; in fact, many farmers regard this as the first essential, and consider that their needs can only be supplied by rapidly growing species. Unfortunately

fast growing species, such as many of the wattles, are often only short-lived, and give no permanent results. Further, many of the best and most useful trees are comparatively slow growing, and should not be rejected on this account alone. However, it must be admitted that rapidity of growth is a useful and very often a determining factor in guiding selection, and it seems that in some cases the best solution would be a compromise. Both fast growing and slow growing species should be planted, the former yielding quick results, and when decay sets in or when they have served their purpose they may be replaced by slower growing but more permanent species. By a judicious mixture of slow and rapid growing species, both quick and permanent results can be obtained.

5. *Root Habit of the Species.*—In windbreaks for orchards and where land is valuable, only those species should be planted which rob as little as possible adjoining land. Species, therefore, with a large development of surface and lateral roots are undesirable in such cases, preference being given to those with deep-rooting tap-roots. Where the site is exposed to high winds, surface rooting species are liable to be blown over and should be avoided. Shallow rooting species have their advantages where the depth of soil is only slight, or where the subsoil is impermeable or badly drained.

6. *Availability of Young Stock or Ease of Propagation.*—Only a limited number of species are stocked by nurserymen, and where the farmer is dependent on such sources for his stock, his choice is limited to a comparatively few species. Where he intends to raise his own stock his choice is wider, and is then largely dependent on availability of seed supplies and ease of propagation. Some species require special attention for successful propagation, and unless the farmer has both the ability and time for such work, such species should be eliminated.

7. *Marketing Considerations.*—When planting for profit the needs of the available markets should be carefully studied. A timber may be intrinsically sound, but there may be no demand for that particular species, or the cost of marketing may be too high.

(*To be continued.*)

Wagga Gladys' Record-making Production.

As hinted might be expected in the article by the late Mr. J. A. Robertson, in the October issue of the *Agricultural Gazette* (page 777), Wagga Gladys of the Hawkesbury Agricultural College Jersey herd, achieved another record by completing a lactation period of 365 days, during which she has yielded 20,835 lb. milk, with an average test of 5.52 per cent., equalling 1,149.38 lb. butter-fat. This constitutes a world's milk and butter record for the Jersey breed, and also makes her average butter production in four consecutive lactation periods 1,052 lb., which is probably another record for any breed. Wagga Gladys has been milked twice a day during the test.

Her performance may be the subject of further reference next month.

Better Pastures for Dairying Districts.

J. N. WHITTET, H.D.A., Agrostologist.

IN most of our dairying districts the need is apparent for a change of food from the ubiquitous paspalum, which has taken possession of the best of the country in our coastal areas.

While providing good food during the warmer months of the year, it suffers considerably from frosts and droughts, and at such periods is of little value for producing and maintaining a good flow of milk.

Fortunately we have in White clover a very nutritious legume, and one of the very few useful plants which will thrive in association with a rampant grower such as paspalum. The clover does not last right through the year, however, and it is necessary to incorporate other plants, and especially legumes, in the pastures, and so endeavour to provide a change of feed for the animals during the four seasons of the year.

Good Pastures Reduce Disease Liability.—If stock have access to succulent pastures they are less liable to become affected with such troubles as rickets, bone-chewing, &c., which are generally associated with poor pasturage. Much poor land will produce infinitely better feed, if it can be broken up and sown with suitable grasses and clovers. On some of the country implements cannot be worked, but winter-growing plants such as Wimmera Rye, Italian Rye, Perennial Rye, Cocksfoot, Sheep's Burnet, and Subterranean clover can be scattered in suitable places on these areas.

By having numerous small paddocks, rather than a few large ones, a system of rotational grazing can be adopted, and by establishing some paddocks of winter grasses and others of summer pastures, each can be grazed at the time when they contain their maximum amount of nutritive material. The grasses and clovers can thus be handled in such a way as to enable them to rest, recuperate, and seed at the correct time, thus maintaining the maximum degree of efficiency in each. Attention should be given to sowing mixtures of grasses and clovers most suitable for the district, and particularly those which provide feed at those times of the year when the natural pastures are at their worst.

If the property is well subdivided, the pastures can be utilised when the feed is most nutritious. Milking cows require palatable feed rich in protein, and the grasses should be fed off when the growth is young, but as the plants mature the fibre increases and the percentage of protein diminishes.

The use of fertilisers, such as superphosphate, stimulates the growth of grasses and legumes, and the amount of mineral matter in the plants is increased, particularly the elements lime and phosphorus, which are essential for the animals' development. Stock grazed on pastures deficient in these

substances invariably become "bone chewers," but by feeding the pasture plants with fertilisers, the composition of the plants is considerably improved. Where a marked increase in the lime content of the soil takes place, the percentage of nitrogen in the pasturage also increases.

We find that stock prefer top-dressed portions of a paddock to unmanured sections, because (1) they are obtaining more lime and phosphorus (two substances essential to the building up and maintenance of the animals' framework), and (2) the top-dressed pasture is more palatable and nutritious, and contains a greater amount of protein, due, mainly (*a*) to the increased growth of clovers and (*b*) to the increased percentage of nitrogen present in the pasture as a whole.

Therefore, by nourishing the pastures, not only is a greater quantity of feed obtained, but a considerable gain in the nutritive value of the plants is effected.

Top-dressing Winter Grasses and Clovers.—Most of our winter grasses, and especially the clovers, respond to fertiliser, and applications of 1 cwt. to 1½ cwt. of superphosphate per acre should be made during the autumn months. Subterranean clover, however, should be top-dressed later in the year—in June or July. It has been demonstrated for many years past, that by top-dressing pastures the growth of the better class grasses is encouraged, and the development and seed production of clovers are increased. Clovers are the most economical forms in which to supply protein to animals, and it is expedient that young growing stock, animals producing and rearing young, and cows in milk, receive large quantities of this valuable nitrogenous material, which is so essential to their well-being.

Stock grazing on pastures remove from the soil an amount of fertility that corresponds to the quantity of meat or milk produced from the pasturage consumed. To counteract this loss the fertility of the soil must be rëimbursed, chiefly through the application of fertilisers.

To Reduce Labour Costs.—To reduce the cost of production, the dairy-farmer is looking to permanent pastures to lessen the necessity for growing large areas of annual crops for green feed. Winter grasses, lucerne, and clovers are being extensively sown in the Central Coast district and the colder parts of the State, and more activity in this matter and in paspalum renovation, should be displayed by South Coast and Northern Rivers dairy-farmers than is the case at the present time.

Winter Grasses and Clovers versus Paspalum.—The price of butter is generally high when the milk flow is decreasing, and this usually occurs during winter months. In districts where frosts are experienced paspalum pastures are then producing little or no nourishing material, and unless succulent winter feed is available the milk flow further diminishes as the winter advances. Where succulent winter grasses and clovers are available, a good flow of milk is assured, not only during the colder months, but during the greater part of the year, on account of the fact that the majority of the plants recommended for coastal districts are perennials.

Here is a concrete example from the Central Coast district, the particulars of which were supplied during July, 1925. A few years ago two persons decided to dissolve partnership; they halved the farm and divided up the herd, picking cow for cow. Both men grew about the same quantity of winter fodders and also Saccaline sorghum. One man decided in 1923 to plant winter grasses and clovers, and Departmental grass plots were established on his property on land that had been down to paspalum for many years; he also planted additional areas of winter grasses and clovers. All seed was sown in autumn, 1923, on paspalum land that had been ploughed the previous summer, and that had been made reasonably free of this grass.

A letter from this farmer reads as follows:—"Referring to my opinion and results of winter pastures, it is now over two years since work was commenced with them, and I am very pleased with the result; particularly last season, as we had a good summer and the paddocks in question threw up a large quantity of feed all the summer, with the exception of February, which was hot and dry. During the winter and early spring of 1924 I had excellent results, and almost doubled the returns which my former partner obtained from the same number of cows (30), which were grazed on paspalum pastures (he has no winter grasses). Of course, we were both feeding about equally well on late-sown Saccaline and cow cane. I beat him rather badly until about November, when he caught me up, the paspalum paddocks then containing a tremendous body of succulent feed. We then remained fairly even through the summer months."

"In April, 1925, the paspalum had 'shot its bolt,' and the winter grasses began to respond to the cooler weather and good rains. As a result of the paspalum being affected by frost, his cows dropped back 200 lb. of commercial butter for the month, whereas mine returned me about 100 lb. more than for March, thus beating the other herd by 300 lb. for April. Since then I have consistently beaten him right through the winter. I planted more winter grasses and clovers last autumn, and also the Toowoomba Canary and Tall Oat grasses you sent me."

The grasses used in these trials were Cocksfoot, Perennial Rye, Tall Fescue, and Prairie; and the clovers were Perennial Red, Cow Grass, and White. When inspecting this area in August, 1924, although the cows had been grazing on the pastures for some time, it was estimated that there was five times as much feed on the winter grasses as on an equivalent area of paspalum. Again, in May, 1925, an inspection showed that the winter grasses and clovers were green and succulent, and the paspalum dry and harsh. This condition of affairs would exist from May to September. The case proves conclusively that during the cooler months of the year winter grasses and clovers will carry milking cows more effectually than paspalum.

Grasses Recommended for Various Situations.—The best winter grasses to grow in coastal districts are *Phalaris bulbosa,* Hooker's Fescue, Tall Fescue, Perennial Rye, Cocksfoot, Tall Oat, and Wimmera Rye.

In swampy land in localities where the winters are not too severe, Para, Floating Water grass (*Glyceria fluitans*), *Lotus major*, and Strawberry clover give good results.

On heath country and also on elevated sandy land in coastal districts, carpet grass (*Paspalum compressum*) is useful for grassing such areas. A striking example of the value of this grass for reclaiming heath country and eradicating bracken fern is to be seen at Woodburn, on the North Coast. Country there has been converted from practically useless sandy wastes into useful grazing areas. Carpet grass, however, has neither the carrying capacity nor the palatability of either paspalum or kikuyu, and is not recommended where these two grasses thrive. It is spreading in many localities on the North Coast and choking out the ordinary paspalum, and as stock do not relish it as much as the better known paspalum, and as it does not produce as much feed, the carrying capacity of the pastures where it is in the ascendancy is becoming considerably reduced.

Clovers.—The most outstanding plant for sowing in coastal districts, and especially amongst paspalum, is White clover (*Trifolium repens*). In many localities White clover is so plentiful that in a good season dairy stock have to be judiciously grazed on it, otherwise losses may occur through hoven or bloat. There are centres, however, where this species of clover is becoming thinned out of pastures through overstocking, and re-seeding of the area is necessary.

Until recently, the idea that the various perennial forms of Red clover (*Trifolium pratense* var. *perenne*) formed little or no seed was generally accepted, but their spread into areas which have not been planted with seed has proved that a fairly liberal amount of seed is formed, especially when the crops are grown under cultivation. During the past few years, the growing of Perennial Red clover on cultivation land and grazing stock on it, has been fairly extensively practised in Central Coast districts and in dairying centres on the Southern Tableland, and it is now quite a common sight to see patches of this clover springing up in paspalum and native grass paddocks. This result is obtained through the cows grazing on clover areas which are in seed. The seed is evidently not affected by the animals' digestive processes, as it germinates freely in the droppings, which form an excellent medium for rapid growth This is also a most satisfactory method of spreading Subterranean clover in pastures. By turning the stock into a profuse growth of Subterranean clover that is carrying large quantities of seed, this valuable legume soon establishes itself among the other pasturage.

Paspalum and its Renovation.—Ploughing the paspalum in March or April every fourth or fifth year with a mouldboard plough, turning furrows about 6 inches wide, and working the furrows down with disc-harrows, disc-cultivators, or tine harrows, and broadcasting the following mixture of seed gives very beneficial results:—Wimmera Rye 2 lb., Italian Rye 2 lb., Perennial Rye 2 lb., *Phalaris bulbosa* 1 lb., Cocksfoot 2 lb., Tall Fescue 2 lb., Subterranean clover 1 lb., Perennial Red clover 1 lb., White clover 1 lb., and Sheep's Burnet 1 lb. per acre. If the soil is friable and deep, include

1 lb. of lucerne in the mixture. Ploughing induces a new root system to develop, and the plant is then better able to assimilate any fertiliser applied and to make full use of the rainfall.

Where it is impossible to plough, broadcast the following mixture amongst the paspalum during the late autumn:—Wimmera Rye 3 lb., Italian Rye 2 lb., Perennial Rye 2 lb., Subterranean clover 2 lb., White clover 1 lb., and Sheep's Burnet 2 lb. per acre. Use the disc harrow or chain harrow where possible to work the seed in and round the crowns of the paspalum plants.

If it is not desired to sow grasses on ploughed land, by broadcasting 1½ to 2 bushels of oats per acre on the area little or no loss of feed is sustained through the paddock being ploughed.

If it is desired to renovate paspalum in localities such as the Dorrigo, where long, cold winter periods are experienced, the grass should be ploughed during spring months; heavy frosts will kill out a big percentage of the grass if it is ploughed during the autumn. As useful grasses such as Cocksfoot, Wimmera, Italian and Perennial Rye grasses, Fescues, *Phalaris bulbosa*, and various species of clovers, provide good feed all the year round, and particularly during the winter months, larger areas should be sown than is the practice at the present time. It is readily admitted by farmers on the Dorrigo plateau, that originally their pastures of Cocksfoot, Rye grass, and clover carried more stock than is the case to-day, when paspalum predominates. Wherever it is possible to do so, it is sound practice to plough up paspalum areas in the autumn, and sow the mixture of grasses and clovers already given for ploughed paspalum areas. This will result in an increased carrying capacity on land which, under paspalum, can only be looked upon as summer pasture.

By ploughing in the autumn a considerable quantity of the paspalum will be killed off, and if a mixture of winter grasses and clovers is sown, a good mixed pasture, with a sprinkling of paspalum, will result.

Manurial Trials with Paspalum.—On red volcanic soils, superphosphate, 2 cwt. per acre, is giving good results, especially where the paspalum has been ploughed. At Wollongbar Experiment Farm the residual effects of ploughing carried out in 1925, and an application of 2 cwt. superphosphate per acre made in the same year, are shown in the following weighings, which were obtained from a cutting made in February, 1927:—

	tons.	cwt.	qr.	lb.
Check plot, unploughed and unmanured	3	7	3	7
Plot, ploughed and unmanured...	5	13	1	13
Plot, ploughed and manured with superphosphate, 2 cwt. per acre (1925 application)...	6	9	0	24

The area from which these results were obtained was thrown open to continuous grazing for eight months prior to being closed up to allow growth to mature for harvesting purposes.

Back to Cultivation.—When it is intended to bring a paspalum paddock back to cultivation it should be ploughed with a mouldboard plough in the autumn, thoroughly worked with a disc harrow or disc cultivator, and a winter fodder crop, such as oats or barley, plus vetches, field peas, or Berseem clover, sown broadcast over the area in June or July.

After the fodder crop has been removed, keep the land worked during the summer months to destroy any paspalum seedlings, and make an early sowing of the winter fodder crop in February or March.

Areas which cannot be Ploughed.—Experiments carried out by the Department at a number of centres in North Coast districts have shown that on very hilly country, where it is impossible to plough, good results are obtained from top-dressing paspalum every second year in August or September with a mixture of superphosphate 2 cwt., and sulphate of ammonia ½ cwt. per acre.

Harrowing the Pastures.—Implements of the chain harrow or similar type, that will give the ground a good scarification and break down and distribute animal droppings, are recommended for use on pasture land. By disturbing the surface of the pasture a seed-bed is formed in which grass and clover seed will readily germinate. A mulch is also produced around the established plants, and rain and soil moisture is better conserved and fertiliser retained than would be the case if the surface soil was in an extremely consolidated condition.

Kikuyu Grass.—This is a useful plant to work in amongst paspalum, or to plant in ploughed paspalum areas, as it will not only hold its own, but in most cases will choke out the other grass. Kikuyu is more drought resistant, and produces more feed during winter months than paspalum, although it must be remembered that it is primarily a summer grower. It does not form seed, and consequently roots have to be planted. The best time to plant is during the spring. Where it is impossible to plough the roots in, such as on hillsides or in stony land, use a mattock or hoe, completely burying the roots 1 to 2 inches deep, so as to prevent stock from pulling them out of the ground during the early stages of growth.

Reports Received from some Growers of Kikuyu Grass.—Mr. G. Scott, Lynch's Creek, Kyogle, writes:—Kikuyu holds its own with paspalum, and for milk production is better than oats. It is growing well in shallow running water and also on stony hillsides.

The Manager, Grafton Experiment Farm, writes:—The cuttings were planted on red volcanic soil. The grass responds well to Grafton conditions, the herbage is soft and succulent, and the leaves are abundant. Cattle eat it readily, preferring Kikuyu to paspalum, Rhodes, and Paddock Love grasses. It is a valuable grass for planting in dirty land, such as freshly-cleared scrub country. Cows milk well when grazing on Kikuyu.

Mr. F. Carr, Palmer's Channel, Clarence River, writes:—Kikuyu is doing splendidly. Cattle are very fond of it, and I consider it better feed than paspalum.

Mr. A. E. Butler, Gleniffer, Bellingen:—I have no hesitation in saying that I consider Kikuyu very suitable for the Bellinger River district. It keeps wonderfully fresh and succulent during the winter months in comparison to paspalum.

Mr. A. E. Braithwaite, Bonnie Doon, Kalang, Bellingen:—Kikuyu is easily the best grass I have. Stock do exceptionally well on it.

Mr. L. Carle, Elands, via Wingham:—Kikuyu has made wonderful growth, and roots have been distributed to many farmers in this district. It will fill a long felt want.

Mr. T. Woodlands, Ourimbah:—I was so much impressed with Kikuyu that all available material is being transplanted into the pasture paddocks. Cattle are very fond of it, and during recent dry spells the grass has given better results than either paspalum or Rhodes.

Mr. C. W. Craig, Jerrara Park, Kiama:—Kikuyu makes wonderful growth producing a mass of fodder much relished by both horses and cattle. Can recommend it for rough, stony ground.

Mr. Edward McGrath, Ocean View, Pambula:—The roots were planted in rich black soil, and the grass made good growth. This is the best grass I have ever seen, and the hot, dry weather never affected it.

Mr. J. W. Grogan, Norewil, Singleton:—Kikuyu has given splendid results, withstanding dry weather well, and readily responds to rain.

Kikuyu Prevents Soil Erosion.—Kikuyu grass is proving exceptionally useful on the volcanic hills of the South Coast, as it not only produces excellent food for dairy stock, but in addition prevents soil erosion on the hillsides.

Mr. H. J. Bate, M.L.A., Tilba Tilba, stated that this grass is going well on the hillsides, making a nice mat of feed, which is readily eaten by stock. It is most useful for preventing soil erosion and assists in checking weed growth.

Mr. C. T. Hindmarsh, Gerringong, reports that Kikuyu has done well on the hillsides; it helps to hold the soil together, and is not tramped out, as is the case with tussocky grasses like Cocksfoot or Perennial rye. If stones are removed from hillsides the soil is washed away, but once Kikuyu is well established the stones can be taken away. Cows are very fond of this grass.

Mr. A. H. Mead, Hill Top, Tilba Tilba:—Kikuyu is doing well on hillsides, especially in washaways and cow-tracks, growing well along the banks of the creeks and even rooting in the water. Stock eat it well.

Ploughing Improves the Palatability of Paspalum.—The superiority of ploughed paspalum pastures over unploughed areas has shown up to a marked degree during the past season. At Mr. W. R. Isaac's property at Murwillumbah the feed on areas ploughed eighteen months ago has been cropped close to the ground, whereas the grass on unploughed portions, located in the same paddock, has been neglected by stock, the feed standing 2 feet to 3 feet high in places.

Increased Carrying Capacity and Yields from Ploughed Paspalum.—Mr. G. E. Neale, of Bangalow, ploughs up his paspalum pastures at least once every five years. During the early spring of 1926 even those paddocks which had been ploughed four years ago were throwing up fresh palatable growths of paspalum, whereas on adjacent areas which have never been ploughed the feed was harsh and very unpalatable. The country consists of red volcanic soil, is fairly steep, and typical of the district. Mr. Neale

attributes the excellent condition of his cows and their high yields during the dry season to the quality of the feed on his ploughed paspalum pastures. His holding of 108 acres is divided into twenty-two paddocks, and sixty head of stock is carried. All of the paddocks have been turned over at some time or other, excepting a few patches which are too steep to plough. As a result of handling the paspalum in the way described, the total production from the cows has increased from 8,000 lb. to 11,000 lb. of commercial butter per annum. These instances illustrate the fact that the effect of ploughing in improving the palatability of the grass continues to be in evidence for a considerable period. When I inspected all these areas last season I was really surprised at the succulence of the paspalum during August on country which was suffering severely from a dry season.

Burning Paspalum.—Some farmers adopt the practice of burning off the dry growth on paspalum pastures. This is not a sound practice, as the crowns and surface roots of many of the plants are destroyed, as well as much seed that is lying on the ground; bare patches result, and weeds and other useless plants become established in the pasture.

Cutting Paspalum for Hay.—Where a mowing machine can be operated, much of the rank growth of this grass can be cut and converted into hay, which is a useful standby during winter months or droughty periods. This work is generally carried out towards the end of the summer season. The grass then makes fresh succulent growth, and, where frosts are not too severe, is in a better condition to go through the winter than if carrying rank, dry, unpalatable feed.

Operations in the Tumut District.—Considerable activity has been shown by landholders in this district in the matter of pasture improvement, the grasses that give the best results on the heavy soils on the flats (which are generally very wet in the winter) being Perennial rye, Wimmera rye, and *Phalaris bulbosa.* White, Perennial Red, and Subterannean are the best clovers. On the lighter types of alluvial flats, which are well drained, lucerne gives excellent returns, and larger areas should be planted with this crop on this class of soil.

Old cultivation land on the undulating country can with advantage be planted with a suitable mixture of grasses and clovers, rather than be allowed to go back to native grasses and herbage. The most satisfactory mixture for this class of country is Wimmera rye 3 lb., *Phalaris bulbosa* 2 lb., Hooker's or Tall Fescue 2 lb., Subterranean clover 2 lb., lucerne 1 lb. per acre.

On the rougher types of hill country in this district, considerable areas are being sown with Perennial rye, Wimmera rye, Cocksfoot, Subterranean clover, and Sheep's Burnet. The seed is scattered on broken land where there is sufficient soil to hold and germinate it; plantings are also made on dug-out rabbit burrows, in and around stump-holes, and any other suitable position where the plants can obtain a good foothold. When those plants are in seed, stock grazing over them distribute the material into other pasture paddocks. This is particularly the case in this district with large

stock grazing on Subterreanean clover, as their droppings provide an excellent medium in which the seed germinates; in addition, the plants make rapid growth, and form a plentiful supply of seed.

The value of improved pastures to the dairy farmers of this district is exemplified in the work carried out on Mr. A. N. Stacy's property, "Camelot," Tumut. Not only are more cows carried than was the case in 1915, but the average return per cow has increased considerably. Mr. Stacy considers that these increases are mainly due to improved pastures, as the area now under cultivation is practically the same as in 1915.

Perenniality of Cocksfoot, Perennial Rye Grass, Perennial Red, and White Clovers.—Owing to the fact that some of the seed of imported Cocksfoot, Perennial Rye grass, and Red and White clovers is being harvested from fields which have not been established for many years, the longevity of plants from this class of seed is considerably reduced. It is advisable, therefore, that farmers who have old established fields of any of these plants, should harvest and plant home-grown seed, and dispose of any surplus to seedsmen and others. When ordering seed of these plants, insist on being supplied with material the perenniality of which is guaranteed. Even though an extra charge of a few pence per pound has to be paid, the additional expenditure will be worth while, as seed produced from old established pastures tends to produce plants of satisfactory longevity. Some of the best Perennial Rye grass pastures we have in the State are in the Tumut district, and I am hoping we will be able to get the farmers in that district to harvest their rye grass seed for sale to farmers in other parts of the State.

Lucerne.—Although lucerne is fairly extensively grown in coastal districts, dairy farmers should endeavour to grow larger areas, as this crop is undoubtedly the most satisfactory hay, green fodder, and grazing proposition available. Once established it lasts for a number of years; although the initial expenditure for seed and preparation of the land is somewhat high, the value of the feed produced during the first two years of the crop's growth more than covers these costs. Lucerne as green feed or hay is excellent fodder for dairy stock. Being a legume, it is rich in protein, an ingredient that is required in large quantities by milking cows in high production. On most dairy farms there is often a shortage of succulent green feed during winter months, and cows respond well if judiciously grazed for a brief period each day on the winter growth of lucerne. At the end of the winter, the fields should be worked with a springtooth cultivator fitted with special lucerne points, to break up any crust formed on the surface soil; a top-dressing 2 cwt. of superphosphate per acre should also be applied at this period.

Small Paddocks and Change of Feed Essential.—In order to obtain the maximum returns from the pastures numerous small paddocks are essential; these will enable the farmer to adopt a system of rotational grazing, thus providing the animals with frequent changes of succulent and nutritious pasturage.

The Care of Milk and Cream.

L. T. MACINNES and G. ROWE.

CONTRARY to the belief of a large number of dairymen, the factory manager or grader does not class cream as second-grade if it can possibly be avoided. In fact, the majority of managers and graders are rather inclined to give the dairymen the benefit of the doubt, and to pass supplies as choice in the expectation of improving the quality by the process of pasteurisation in the case of cream intended for butter-making, and by blending doubtful with good quality milk for cheese-making.

Very largely because of this practice, managers occasionally receive word from the Sydney end that a consignment of butter or cheese has been graded down to first-grade, and in some instances to second-grade, on its arrival there, and as a result the whole of the suppliers have to pay the penalty in £ s. d., owing to the carelessness of a few. It is true that the penalty has not been very heavy in the past, and the risk may have seemed justifiable, but the margin of prices between choice and inferior grades is likely now to be greater, especially so when there is such keen competition to capture the local market, which requires a consistent choicest grade standard, and gets it. The advent of an Australian national brand (Kangaroo) for overseas export has also placed an added premium on choicest.

Dairymen can rest assured that graders at dairy produce factories know the difference between good and bad quality, and if the milk or cream is classed out of choice grade, it has an off flavour or taint of some description or other. No manager or grader desires to receive milk or cream of inferior quality at the factory.

The cause of the inferiority is to be found somewhere between the cow and the factory, and can usually be overcome by cleanliness and attention to detail—not by assuming that all the conditions under which it was produced are ideal, and that the factory manager, grader, or Dairy Branch field officer is wrong. Milk and cream which is graded other than choice at the factory is known as "tainted," and the origin of the taints might be divided into four sections—food taints, absorbed taints, chemical taints, and bacterial taints.

Food Taints.

Food taints are somewhat beyond the control of dairymen as a rule, as they are caused by the food eaten by the cows, but in the case of pastures which are known to contain large quantities of lucerne, clover, and allied fodders, a big improvement can be made in quality if the cows are kept off such pastures for at least two or three hours before being milked.

Aerating and cooling the milk in the case of a milk supply, and the cream between the separator and the cream-can by using a cooler in the case of cream supply, is recommended, as in this way much of the food flavours and aromas are eliminated.

Cows eating carrot weed give an exceptionally bad tainted milk, and of all the food taints common in most dairying districts, especially in the spring time, this is probably the worst, as it does not improve in any degree when treated. Treatment in fact, when heat is applied, tends to make the flavour more objectionable, especially so in butter. Most other food flavours can be improved to a greater or lesser degree by treatment of the product at the factory.

Absorbed Flavours.

Butter fat has the property of readily absorbing the odour of anything placed in close proximity to it; therefore, milk or cream should never be stored near any fruit, kerosene oil, or any strong smelling material.

Common absorbed flavours met with in creams are due to the absorption of exhaust fumes from oil engines, leaky valves, odour of oil on floors and separator block, smoke from dairy and bush fires and the use of chemicals and disinfectants in washing-up water in the dairy.

These defects are easily overcome by extending the exhaust from the engine so as to blow clear of the building, by keeping fire smoke from, and all strong smelling substances out of the dairy, and by not using strong smelling chemicals or disinfectants in the wash-up water.

If possible, to minimise the risk of contamination, the engine should be placed in a different room from the separator, the driving belt being put through the wall.

Chemical and Bacterial Taints.

Butter fat itself is not a food for bacteria, which live on the other constituents of milk, *i.e.*, the casein, milk sugar, and albumen. The bacteria live and thrive in the milk or cream on the constituents mentioned, and by their action, change their chemical composition, thus causing more or less objectionable flavours, according to the class and number of bacteria present, and in extreme cases the chemical composition of the whole is affected. Butter fat is readily susceptible to chemical change, even without the action of bacteria, and the two commonest forms of chemical taints in cream we know as *tallowy and metallic.*

The particles of fat easily become oxidised if left in contact with warm metal surfaces, and if a large surface is exposed to the air and allowed to dry on the surface. No treatment will improve cream affected with tallowy or metallic taint, and the process of heating during pasteurisation of creams with these taints increases the defects.

Metallic taint is usually associated with thin, high acid creams and the use of old, rusty, or badly kept dairy utensils.

Tallowy taint is generally connected with stale cream, probably rich in butter fat, which has not been carefully attended to, with unclean utensils, or with oxidisation due to exposure of the surface to the air too long without stirring.

These two taints, metallic and tallowy, are particularly stressed, as both cause a tallowy flavour in the resultant butter, and this is one of the worst troubles the butter-maker has to contend with at the present day, for the

butter has not the characteristic flavour natural to it, but the flavour of a tallowy fat. Therefore, cream of this nature must always be classed as second grade.

To return to bacterial taints, it is advisable to know that bacteria are the smallest form of vegetable life known to science, and are individually invisible without the aid of a powerful microscope. They pervade everything and everywhere, and while they perform necessary and useful functions in the world, as far as dairymen are concerned they are largely detrimental to their products. Under commercial conditions it is impossible for any farmer to supply milk or cream wholly free from bacteria, but careful attention to a few simple details will greatly lessen the bacterial content. As an example, a cubic centimetre of bad milk or cream may contain up to a hundred million or more of undesirable types.

These undesirable types are common in bad water supplies, and in places where strict cleanliness is not observed, and they bring about taints in cream known to cream graders as unclean flavour, ropy cream, cowy flavour, cheesy flavour, albuminous cream, &c.

The common defects in cream have been compiled by the Department into a chart, which gives the defect, cause, and remedy for the information of the dairyman. The chart is simple and easy to follow, and should be placed in a prominent position in every dairy.

Such tainted creams, although they may not be very marked, if mixed with the choice grade on arrival at the factory, may continue to develop in the butter churned therefrom, with the result the factory manager will be notified the butter has been graded down from choicest quality.

Three conditions are essential to bacterial life, *i.e.*, food, heat, and moisture. The dairyman cannot help the fact that cream is a good food for bacteria; neither can he help the presence of moisture, but by separating the cream at from 38 to 42 per cent. butter fat content in the warmer months of the year, he can reduce the available food (casein, milk, sugar, and albumen) and check development. The only other controlling factor left is heat. The ideal temperature for bacterial development is about blood heat, that is about the temperature of milk when drawn from the cow, and also the average atmospheric temperature in Australia in summer time, 90 to 100 degrees Fah. The lower the temperature the cream is reduced after separating, the greater will be the check to bacterial growth, since development practically stops at 60 degrees Fah. or lower; therefore, if the temperature is reduced to 70 to 75 degrees Fah., a noticeable improvement in quality can be expected.

Cooling.

If properly used under clean conditions, nothing will give better results than a milk or cream cooler. Several very efficient types with a water bag attachment are on the market at comparatively low series. Besides lowering the temperatures of the milk or cream, and thus checking bacterial development, coolers aerate the milk or cream, release gases, food flavours, &c., and in the case of cream, improve its body and consistency.

If coolers were generally used, there is no doubt that a marked improvement in quality of milk and cream delivered to both cheese and butter factories would take place. Care should be taken to thoroughly *wash and boil* a cooler after use, or otherwise it will become a source of infection. It is advisable always to mix creams already held in the dairy immediately the fresh cream is cool, and not to keep the lots separate until delivery to the factory. The mixed creams should be stirred with a metal stirrer several times a day to keep the mass uniform.

Sources of Infection.

Most of the troubles in milk and cream are caused by organisms closely associated with cow manure. Milk in the udder of a healthy cow in normal condition is practically free from bacteria, but directly it is drawn from the cow by ordinary methods of milking it may contain many thousands of bacteria per c.c. The first point of infection is the teat. Cows lying down will often squeeze out a drop of milk, which becomes infected with bacteria from the ground. These work up through the teat canal and multiply rapidly. Thus the first milk drawn from the cow generally contains large numbers of objectionable organisms, and dairymen are well advised to discard the first few squirts of milk as drawn. Practically nothing is lost in doing so, as it has been definitely proved that this first milk contains practically no butter fat.

Again, infection is caused from dust in the cows' flanks and udders falling into the milk buckets. To prevent this, udders and flanks should be washed or well wiped with a damp cloth before milking, and this has the added advantage that such treatment is liable to overcome sore teats. If a little formalin or Condy's fluid is added to the water used for this washing, it will be found to be an advantage. The cow bails and yards should at all times be kept clean, free from dust, cow dung, and urine.

Unclean utensils, buckets, strainers, &c., should be avoided, and in this direction it is well to remember that no dairy utensil is clean unless it has been scalded with *boiling water.* This will destroy any bacteria which might remain, and by the heat the utensil will dry immediately. Always remember that water that has been *boiled,* then carried some distance and allowed to stand for a few minutes is not *boiling water,* and as such has lost efficiency as a germ killer.

Everyone advocates straining the milk, yet a dirty strainer (cloth or gauze) is worse than no strainer. It is sometimes noticeable after a bucket of milk has been emptied into a can, certain foreign substances have been intercepted by the strainer. These are left there, and the next bucket of milk poured over it. When this has been done a few times the foreign substance disappears, dissolved, and washed into the milk. Of what advantage is it to use the strainer in such a manner? It would be just as well not to use a strainer. Very little if any time is lost by either shaking out or rinsing the strainer occasionally, and large numbers of objectionable bacteria and other unclean substances would not be added to the milk.

Clean hands and clean clothing are almost as important as clean utensils. Washing of the hands during milking operations should be considered very important.

Separators should be thoroughly washed and scalded both night and morning after using. The modern separator is comparatively easy to clean, and to get the best results the parts should be placed in *boiling* water. When taken out, the heat generated will cause the metal to dry rapidly and thus lessen the chance of rusting and deterioration; the boiling water will destroy any germ life remaining after washing.

From the point of public health, the dairyman who does not wash his separator at night after using, should be prosecuted, for it is a very unclean practice, even if the results are not bad enough to affect his monetary returns.

Unclean cans are a serious source of infection. No man can be certain of producing choice quality if he does not wash and scald his cans and allow them to cool before using them, even though he may think they are clean when returned from the factory. If this is not done and the quality is still choice when graded, it is more by good luck than good management, for in many cases where the cans are not scalded the cream in flavour is graded second, with the remark "unclean flavour."

Where can-washing machines are installed and efficiently used at the factories, the danger of contamination is greatly lessened. Cans so washed are dried out by heat, and do not have an objectionable smell when lidded for a lengthy period.

In cases where petrol tins are used to keep the cream in at the dairy, the seams at the bottom and sides should be first well soldered, otherwise they are a source of contamination. It will be noticed if they are not soldered, after use for some time a yellowish, rusty slime will collect in the seams, even if the tin looks clean. This slime is practically a bacterial culture, and readily affects the quality of the cream.

The rules which apply to keeping dairy utensils, bails, and yards clean, are also applicable to the cream and separator rooms. Second-grade cream has often been traced to unclean floors in these rooms. Milk and cream are at times spilt and get into the cracks in the floor; bacteria develop there, and eventually float up into the air, finally settling in and contaminating the cream. Floors should be washed with clean boiling water and soda, and scrubbed with a broom, and if the floors are well drained, as they should be, they will be dry in a few minutes; thus the rooms would be sweet and clean. The use on the floors of water that has previously been used for washing up purposes cannot be too strongly condemned; it is a foolish and objectionable practice, as this water contains milk constitutents which remain on the floor and form an excellent breeding ground for undesirable types of bacteria.

All shelves, tables, stands, &c., should be kept clean by scrubbing and scalding, for if allowed to become unclean they are another source of infection.

Need of Boiling Water.

Boiling water is absolutely necessary in dairy work to ensure cleanliness, and as it is easy enough to secure a supply, there should be no sparing of it. It is well, however, not to start washing the utensils with water that is boiling, for this very high temperature has a tendency to cause the albumen to coagulate, and stick to the utensil in a thin, often invisible, film that supplies a breeding ground for bacteria. Wash the utensils first with warm water, with a little washing soda or other alkali added, using good brushware (cloths being very objectionable), after which they should be scalded in ample boiling water, and then placed in a clean place to dry.

Transportation.

Many dairymen seem to be under the impression that once their cream supplies are placed on the roadside, their responsibility is ended. This is not so, for the grader classes the cream choice or otherwise in accordance with the quality and condition in which it arrives at the factory. The closest attention is therefore required to protect it until it reaches the grader. When cream is placed at the roadside to wait for the carrier, it should be carefully protected from the heat and direct rays of the sun, since if it is allowed to get warm in this way, rapid deterioration takes place, tallowy or metallic taints generally being the result. This is easily controlled, and every dairyman should give the matter attention. A shelter should be built at the roadside, and so arranged as to keep the cream cool while it awaits the carrier.

Dairy-farmers should take action if they notice a cream carrier not having the cream satisfactorily protected by a covering from the rays of the sun, as provided for under the "Dairy Industry Act." Even on dull days the cream cans should be covered, otherwise there is a possibility of the cream being delivered to the factory other than choice.

As the factories are co-operative, and most suppliers are shareholders, it should be their aim to assist to maintain a high standard of butter and cheese quality at their respective manufacturing centres.

Conclusion.

To make certain of always producing the highest quality milk and cream, care and strict cleanliness are most essential during all stages of production, and the surroundings, as well as the inside of the bails and buildings, should be kept clean and free from all contamination by dust, objectionable smells, &c. Remove the skim milk taken from the dairy after each separating. Observe and enforce the utmost cleanliness about the cattle, their attendants, and all utensils. Do not add preservative of any description to the milk or cream. Keep it clean and cool. The value of ample boiling water at 200 to 212 degrees Fahr.—not 140 to 150 degrees—cannot be over-estimated.

To sum up, the cardinal requisites for the production of wholesome and good flavoured milk and cream are:—

Healthy cows and attendants.
Wholesome feed and pure water.
Strict attention to cleanliness.
Prompt cooling.
Protection in transportation.
Frequent deliveries to factories.
Absence of feeds and weeds that produce objectionable odours and flavours.

In the event of any dairy-farmer having trouble with the quality of the milk or cream supplies, the Dairy Branch, Department of Agriculture, is available and only too willing to give all the assistance possible at no expense to the farmer, to endeavour to find the cause of defects, and to explain how to remedy them.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
New England Girls' Grammar School, Armidale	14	15 Oct. 1927
Lunacy Department, Morisset Mental Hospital	16	18 ,, 1927
Department of Education, May Villa Homes	6	3 Nov., 1927
Department of Education, Eastwood Home	10	3 ,, 1927
Department of Education, Hurlstone Agricultural High School	47	4 ,, 1927
Hygienic Dairy Company, Glenfield Farm, Casula, Liverpool	113	6 ,, 1927
Lunacy Department, Rydalmere Mental Hospital	61	23 ,, 1927
A. E. Collins, Hazelhurst Dairy, Bowral	13	6 Dec., 1927
Miss Brennan, Arrankamp, Bowral	27	7 ,, 1927
Lunacy Department, Callan Park Mental Hospital	26	15 ,, 1927
Department of Education, Yanco Agricultural High School	26	12 Jan., 1928
A. V. Chaffey, "Lilydale," Glen Innes	15	25 ,, 1928
Lunacy Department, Kenmore Mental Hospital	99	1 Feb., 1928
Walaroi College, Orange	4	3 ,, 1928
Lunacy Department, Orange Mental Hospital	3	7 ,, 1928
Australian Missionary College, Cooranbong	51	11 ,, 1928
Department of Education, Gosford Farm Homes	18	18 May, 1928
William Thompson Masonic Schools, Baulkham Hills	34	31 ,, 1928
E. P. Perry, Nundorah, Parkville (Guernseys)	30	8 June, 1928
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	38	11 ,, 1928
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	70	16 ,, 1928
Department of Education, Mittagong Farm Homes	30	22 ,, 1928
Sacred Heart Convent, Bowral	11	23 ,, 1928
R. Burns, Wilga Glen Dairy, Coonamble	49	23 ,, 1928
Dominican Convent, Moss Vale	4	24 ,, 1928
Kyong School, Moss Vale	2	3 Aug., 1928
Riverstone Meat Co., Riverstone Meat Works, Riverstone	113	20 ,, 1928
Marist Brothers' Training School, Mittagong	80	25 ,, 1928
Blessed Chanel's Seminary, Mittagong	3	26 ,, 1928

—MAX HENRY, Chief Veterinary Surgeon.

Improving the Sweet Potato Crop.

J. DOUGLASS, H.D.A., Agricultural Instructor.

THE past season was one of the worst on record for sweet potato growers. The spring was very dry, and in most localities the weather continued dry right through the summer until just before Easter. Places right on the coast line, however, experienced fair rains during the summer, and this, combined with high soil temperatures, produced good crops. Districts a few miles off the coast were not so fortunate, and the rain came too late to be of any great benefit. The Easter rains were so heavy that the crops in low situations were drowned and any tubers decayed. This was the case with the experimental plots at Terrigal, Tumbi Umbi and Miranda.

Two new ideas were introduced into the experiments this year: (1) The selection of seed potatoes, with the object of improving the quality and type; (2) a fertiliser trial was conducted with the object of ascertaining the most suitable fertiliser to use on the sweet potato crop.

Root Selection.

It has been noticed that in the sweet potato crop there is a big variation in types in most individual varieties. This may be due to several causes, but it becomes accentuated when no means are taken to check or rectify it. By the judicious selection of individual roots a marked improvement can be obtained in a comparatively short period. The improvement aimed at is mainly quality, although an increase in yield is also obtained. The Department of Agriculture has for some time been trying to popularise the chunky types of tuber, and it was on one of these varieties that selections were made in order to obtain reliable data of the work. In all sweet potato crops, individual plants are found which have an abundance of fibrous roots that fail to develop normally and that produce only small tubers, if any. These tubers, if lifted with the crop, are usually selected as being the right size from which to produce plants, and it naturally follows that such plants have a depressing influence on the yield and quality of the resultant crop.

This type of plant is avoided when selection is properly carried out, as with all crops field selection of individual plants should be rigidly carried out annually. The tops should be removed and the roots lifted and left in position until a specified area is dug. The total plants should then be examined and individual selections made. These selections should be more than the actual number required, as a further reduction is made for keeping quality.

When making selections it should always be remembered that uniformity of type is more important than varietal characteristics. Select early-maturing plants with a medium number of roots of uniform quality, size, and appearance.

From a farmer's point of view selection should be carried out along the following lines:—

1. Avoid plants of low yielding qualities.
2. Avoid plants producing one or two roots of excessive size.
3. Avoid plants with a large number of long narrow roots.
4. Avoid late maturing plants.
5. Avoid diseased plants. To do this, growers should become acquainted with the different diseases.

Plant-breeders should keep the selections separate and continue to make individual selections, but farmers will obtain excellent results by making field selections as outlined, and producing the plants for the resultant crop from the selected roots.

Manurial Trial with Sweet Potatoes
On the left, unmanured; on the right manured.

The following comparison shows the increase in yield obtained by only one year's selection; though, as pointed out before, the main value of this work lies in making the crop more uniform in every respect, rather than greatly increasing the yield. The variety used in this trial was Nancy Hall:—

	t.	c.	q.	lb.
Yield from selected seed tubers	4	0	1	12
,, non-selected seed tubers	3	15	0	0

Manurial Trial.

As the Department of Agriculture has no definite recommendations for the fertilising of the sweet potato crop, two trials were planted last season with the object of obtaining information.

The districts selected were Terrigal and Penrith. At Terrigal, the soil is sandy and very suitable for this crop; unfortunately, however, this plot was destroyed by excessive rains. At Penrith, the soil was light loam, not

altogether typical of the best sweet potato soil. The late rains and early winter considerably reduced the yield of this plot, but an interesting set of results was obtained. It will be seen that basic superphosphate reduced the yield below that of the no-manure plot. However, all other fertilisers produced an increase in yield, and the plots treated with a combination of nitrogen and phosporic acid produced the heaviest yield. P7, a mixture of equal parts of superphosphate and bonedust, produced the heaviest yield, equal to that of P10. P7 contains a small percentage of nitrogen, but owing to the slow manner in which the fertilising materials in the bonedust become available, the plant receives a more uniform and continuous supply of plant-food over a longer period than from the other mixtures. In a normal year it is thought that this mixture will give better results than a complete manure, such as P10.

	t.	c.	q.	lb.
426 lb. P 7 (equal parts bonedust and superphosphate)... ...	5	11	3	24
575 lb. P 10 (10 parts superphosphate, 1½ parts each sulphate of ammonia and sulphate of potash)	5	11	3	24
525 lb. P 1 (10 parts superphosphate and 1½ parts sulphate of ammonia)...	5	6	0	8
448 lb. superphosphate	3	16	2	12
No manure	3	4	3	8
525 lb. P 2 (10 parts superphosphate and 1½ parts sulphate of potash)	3	2	0	8
512 lb. basic superphosphate	2	7	0	16

Variety Trials.

The varieties included in these trials have been fully discussed before, and do not require further description. It will, however, be noticed that Nancy Hall and Yellow Strassburg again yielded well.

Variety.	J. Carter, Penrith.				A. Smith, Wyong.			
	t.	c.	q.	lb.	t.	c.	q.	lb.
Nancy Hall	3	4	3	8	4	16	1	10
Yellow Strassburg ...	4	6	1	20	....			
Vitamine	3	18	2	8	....			
Director	3	8	3	0	4	11	0	8
Southern Queen ...	3	0	3	16	4	0	1	12
Brook's Special ...	2	15	0	0	2	8	0	24
Farmer's Special ...	2	5	1	22	....			
Brooke's Gem	1	14	2	0	4	3	0	4
Pierson	1	7	2	0	3	6	3	24
Porto Rico	1	11	1	20	2	16	1	0

INFECTIOUS DISEASES REPORTED IN SEPTEMBER.

THE following outbreaks of the more important infectious diseases were reported during the month of September, 1927:—

Anthrax	Nil.
Pleuro-pneumonia contagiosa	4
Piroplasmosis (tick fever)...	Nil.
Blackleg	1
Swine fever	10

—MAX HENRY, Chief Veterinary Surgeon.

The Codling Moth.

Cydia pomonella, L.

PART III.

S. L. ALLMAN, B.Sc. Agr., Assistant Entomologist.

Miscellaneous Observations.

Overwintering Larvae.—During the examination of the trees and bandages in the early spring, 3,728 larvae and pupae were destroyed. Of this number thirty-eight, or 1.02 per cent., were found beneath the surface of the soil, but immediately adjacent to the trunks of the trees. A search of the surrounding soil failed to reveal any larvae in cocoons away from the trees, and as clean cultivation methods had been practised this was to be expected.

Overwintering period of codling moth larvae.—The overwintering period of 155 larvae was determined. As the larvae were collected at intervals of seven days and the periods given represent the number of days from collection to the pupation of the larvae, the actual overwintering period may have been up to seven days in excess of the stated period. The minimum overwintering period was 154 days, the maximum 233 days, and the average 191.19 days.

TABLE 1.—Overwintering period of Larvae of the Codling Moth at Bathurst, 1926-27.

Wintering Period in Days.	Number of Individuals	Wintering Period in Days.	Number of Individuals.	Wintering Period in Days.	Number of Individuals.	Wintering Period in Days.	Number of Individuals.
154	1	177	1	192	6	207	5
155	1	178	1	193	5	208	2
156	2	179	1	194	6	209	2
157	1	180	2	195	3	210	2
158	1	181	6	196	2	211	3
159	1	182	2	197	2	212	2
162	5	184	4	198	2	214	3
166	1	185	4	199	5	215	8
167	3	186	4	200	1	217	1
170	4	187	6	201	3	218	1
171	3	188	1	202	4	226	1
172	3	189	6	203	1	227	1
174	2	190	4	204	2	233	1
175	1	191	4	206	2		

Average wintering period in days ... ... 191·19
Maximum wintering period in days 233
Minimum wintering period in days 154

Time of Day the Moths Emerge.

Hourly emergence of spring-brood moths.—The hours of emergence of seventy spring-brood moths were recorded. No emergence took place before 8 a.m. or after 3 p.m. The maximum period of emergence was between 8 a.m. and 9 a.m., when twenty-nine, or 41.43 per cent., of the moths had emerged. The majority of the moths had emerged before 11 a.m., 87.14 per cent. being the total emergence between 8 a.m. and 11 a.m. Observations were carried out on ten separate days.

Hourly emergence of first brood moths.—First brood moths commenced to emerge after 7 a.m. and continued to do so up to 6 p.m., and so over a much longer period than that obtaining for spring-brood moths. The maximum emergence occurred between 9 a.m. and 10 a.m. Table 2 indicates the hours of emergence of sixty-five first brood moths.

TABLE 2.—Hour of Emergence of Moths of the first brood at Bathurst, 1926-27.

Date of Emergence of Moths.	Number of Moths Emerging at—												Total Number of Moths.
	a.m.						p.m.						
	7	8	9	10	11	12	1	2	3	4	5	6	
5 Jan. ...	0	0	3	4	0	3	4	5	1	3	3	0	26
7 " ...	0	0	0	2	3	1	0	1	1	1	3	0	12
25 " ...	0	2	3	6	5	1	1	0	3	2	3	1	27
Total ...	0	2	6	12	8	5	5	6	5	6	9	1	65
Per cent. ..	0·00	3·08	9·23	18·46	12·31	7·69	7·69	9·23	7·69	9·23	13·85	1·54	......

Oviposition by Individual Codling Moths.

Spring brood moths.—Some difficulty was experienced in obtaining eggs from individual female moths, even when segregated with several male moths. In several instances pairs of moths were removed from breeding jars several days after emergence and before any eggs had been deposited. Table 3 gives the data for fourteen female moths. The maximum egg deposition for a single moth was ninety-eight, of which sixty-six were deposited on one day.

TABLE 3.—Oviposition by Individual Female Moths of the Spring brood at Bathurst, 1926-27.

Observation.	Number of Males.	Date of—				Number of days.			Length of Life of Female after Oviposition.	Length of Life of Female Moth.	Number of Days on which Oviposition Occurred.	Total Number of Eggs.	Average Number of Eggs per Oviposition.	Maximum Number of Eggs Deposited on 1 Day.
		Emergence.	First Oviposition.	Last Oviposition.	Death of Female.	Before Oviposition.	Of Oviposition.	From Emergence to Last Oviposition.						
1	5	19 Oct.	......	......	6 Nov.	...	...	...	...	18	...	0	...	...
2	3	22 ,,	29 Oct.	2 Nov.	9 ,,	7	5	11	7	18	5	98	19·6	66
3	4	24 ,,	......	......	8 ,,	...	...	...	...	15	...	0	...	...
4	1	1 Nov.	19 Nov.	24 Nov.	28 ,,	18	6	23	4	27	3	6	2	3
5	1	2 ,,	......	......	14 ,,	...	...	...	...	12	...	0	...	...
6	1	2 ,,	......	......	22 ,,	...	...	...	...	20	...	0	...	...
7	1	2 ,,	......	......	15 ,,	...	...	...	...	13	...	0	...	...
8	2	9 ,,	20 Nov.	20 Nov.	30 ,,	11	1	11	10	21	1	2	2	2
9	2	12 ,,	12 ,,	20 ,,	2 Dec.	0	9	8	12	20	6	21	3·5	6
10	5	15 ,,	......	......	3 ,,	...	...	...	...	18	...	0	...	...
11	2	18 ,,	......	......	22 ,,	...	...	...	...	34	...	0	...	...
12	1	4 Dec.	......	......	14 ,,	...	...	...	...	10	...	0	...	...
13	3	16 ,,	......	......	10 Jan.	...	...	...	...	25	...	0	...	...
14	2	17 ,,	......	......	28 Dec.	...	...	...	...	11	...	0	...	...
...	...	......	......	......	......	...	...	...	...	...	15	127	...	...

Summary.

	Average.	Maximum	Minimum.
Number of days before oviposition	9·00	18	0
Number of days from emergence to last oviposition ...	13·25	23	8
Number of days of oviposition	5·25	9	1
Number of days on which oviposition occurred ...	3·75	6	1
Number of days female moth lived after oviposition...	8·25	13	4
Length of life of female moths in days	18·71	34	10
Number of eggs deposited by one female moth ...	9·07	98	0
Number of eggs deposited by one moth in one day ...	8·47	66	0

First brood moths.—Ten individual female moths were segregated. The usual procedure was to remove the pairs after they had been in the larger breeding jars for several days, and before any eggs had been deposited. Some moths were actually observed in copulation and placed in separate jars. Copulation apparently took place most commonly late during the evening or night, and those instances observed were generally abnormal, as it was evident that the moths remained in copula for a number of hours. In one instance a pair remained in copula for several days, and ultimately died in this abnormal condition. The maximum number of eggs deposited by one moth was fifty-one, of which forty-two were deposited on one day.

TABLE 4.—Oviposition by Individual Female Moths of the first brood at Bathurst, 1926-27.

Observation.	Number of Males.	Date of— Emergence.	First Oviposition.	Last Oviposition.	Death of Female.	Number of days. Before Oviposition.	Of Oviposition.	From Emergence to Last Oviposition.	Length of Life of Female after Oviposition.	Length of Life of Female Moth.	Number of Days on which Oviposition Occurred.	Total Number of Eggs.	Average Number of Eggs per Oviposition.	Maximum Number of Eggs Deposited on 1 Day.
1	1	20 Jan.	......	......	8 Feb.	...	...	...	...	19	...	0	...	...
2	1	24 „	1 Feb.	2 Feb.	8 „	8	2	9	6	15	2	16	8	9
3	1	25 „	......	......	9 „	...	...	...	...	15	...	0	...	...
4	1	25 „	1 Feb.	1 Feb.	11 „	7	1	7	10	17	1	3	3	3
5	1	25 „	29 Jan.	1 „	13 „	4	4	7	12	19	2	2	1	1
6	1	25 „	......	......	4 „	...	...	...	...	10	...	0	...	...
7	1	25 „	......	......	7 „	...	...	...	...	13	...	0	...	...
8	1	25 „	6 Feb.	6 Feb.	14 „	12	1	12	8	20	1	1	1	1
9	3	30 „	7 „	19 „	17 „	8	3	10	8	18	3	51	17	42
10	2	15 Feb.	......	......	5 Mar.	...	...	...	...	18	...	0	...	...
	...	......	......	......	......	...	...	...	...	...	9	73	...	...

Summary.

	Average.	Maximum.	Minimum.
Number of days before oviposition	7·8	12	4
Number of days from emergence to last oviposition ...	9·0	12	7
Number of days of oviposition	2·2	4	0
Number of days on which oviposition occurred ...	1·8	3	0
Number of days female moth lived after oviposition ...	8·8	12	6
Length of life of female moth in days	16·4	20	13
Number of eggs deposited by one female moth ...	7·3	51	0
Number of eggs deposited by one moth in one day ...	8·1	42	0

Time of Deposition of Eggs.

Hourly oviposition by spring brood moths.—A number of jars containing spring brood moths were kept under observation and the number of eggs deposited each hour recorded. These observations were continued until 6 p.m., and the next counting took place at 9 a.m. of the following day. The earliest deposition recorded was between 11 a.m. and 12 noon, and the majority of the eggs were deposited between 4 p.m. and 6 p.m. It was therefore decided when drawing the graphs for the egg-deposition records that the temperature between 2 and 8 p.m. would be most likely to influence the deposition, and the average temperature for that period has been used, and not the average daily temperature as used in other graphs.

The influence of temperature is well shown in Table 5, under observations carried out on 22nd November. Oviposition had commenced before 12 noon and eight eggs had been deposited by 3 p.m. Earlier indications promised

the deposition of a large number of eggs, but a very sudden storm arose and a big drop in temperature eventuated—viz., from 92 deg. Fah. at 12 noon to 64 deg. Fah. at 4 p.m., at which hour no eggs were recorded. The temperature then commenced to rise slightly and more eggs were deposited. It appears therefore that low temperatures prevent egg deposition, and from other observations it appears that little or no deposition takes place when the temperature is 60 deg. Fah. or lower. Table 5 gives further details of the hours of deposition of eggs by moths of the spring brood.

TABLE 5.—Hour of Deposition of Eggs by Moths of the spring brood at Bathurst, 1926-27.

Hour of Observation.	Date of Oviposition.								Total No. of Eggs.	Average Temperature.	Per cent. of Eggs per hour.
	Nov. 12.		Nov. 19.		Nov. 22.		Nov. 23.				
	No. of Eggs.	Temperature.	No. of Eggs.	Temperature	No. of Eggs.	Temperature.	No. of Eggs.	Temperature			
11 a.m.... ...	0	80	0	76	0	92	0	80	0	79·5	0·00
12 noon ...	0	83	0	79	1	92	0	64	1	79·5	0·33
1 p.m. ...	0	87	0	80	0	82	17	73	17	80·5	5·57
2 p.m. ...	2	87	0	82	4	70	12	75	18	78·5	5·90
3 p.m. ...	4	87	9	81	3	65	11	75	27	77·0	8·85
4 p.m. ...	21	86	6	82	0	64	13	74	40	76·5	13·11
5 p.m. ...	33	83	44	77	1	66	8	72	86	74·5	28·20
6 p.m. ...	44	79	1	78	19	67	10	63	74	71·8	24·26
Following day 9 a.m. ...	29	...	6	...	5	...	2	...	42	...	13·77
Total ...	133	...	66	...	33	...	73	...	305	...	...

Hourly oviposition by first-brood moths.—No detailed records were obtained for moths of the first brood, but it was apparent that oviposition commenced about the same time as that of the spring-brood moths, but that it continued over a longer period on account of the higher evening temperatures then prevailing.

Place of Deposition of Eggs.

Moths confined in breeding jars deposited eggs mainly on pear leaves, which were renewed daily, and to a lesser extent on the glass jars. In a few instances eggs were deposited on the moistened soil and upon the wings of other moths.

Of 290 eggs recorded in the field before 15th December, and therefore deposited by spring brood moths, 214, or 73.79 per cent., were deposited on the leaves or twigs. The remaining seventy-six eggs, or 26.21 per cent., were deposited on the apples, or very occasionally on the stems.

The eggs were deposited singly, but where numbers of eggs occurred two or three eggs were observed on a single leaf or apple. Eggs were most abundant from a height of about 4 feet to the tops of the trees, and were deposited more freely on large trees with abundant foliage than on smaller trees carrying less foliage.

Egg deposition on apples and pears.—Where apples and pears are grown in a mixed orchard the spring brood moths oviposit almost exclusively on the apple trees. Few eggs were recorded on pear trees until early in January and after the emergence of the earliest first brood moths. Eggs were then deposited in numbers on pear trees, and as abundantly as on apple trees.

Hatching of Eggs.

Various germinal changes were observed prior to the hatching of the eggs. These have been recorded in a previous paper. The "black spot" indicates the black head of the larva, and this becomes apparent one to two days prior to the emergence of the larva. When ready to emerge the larva may be seen to move its mandibles, and ultimately it forces the point of one through the egg shell. It then proceeds to enlarge the opening so formed, and when it is large enough to allow the head to emerge the larva leaves the shell. Difficulty is sometimes experienced in making this exit, and the time may vary from a few minutes to several hours. In one instance a larva was noted to be caught in the opening so formed, and it finally died in this position, being unable to extricate itself.

In every instance under observation the exit hole was formed near the periphery of the egg shell, and never at the top of the egg or through the portion of the shell adjoining the leaf surface.

The newly hatched larva is white and slender, and has a black head which appears out of proportion to the rest of the body. It is about one-sixteenth of an inch long, or about the diameter of an ordinary pin's head.

Behaviour of Newly-hatched Larvae.

Immediately on emergence the larva commences an active search for food. When placed on apples they move about rapidly seeking some advantageous place to enter. They investigate the calyx end and irregularities on the skin, and may commence to enter the fruit in less than thirty minutes from the time of emergence from the egg. Damaged surfaces or points of contacts between apples are commonly chosen. In the field, entrances are often effected where leaves or other objects touch the apples. After some time larvae become less active and may frequently be observed to remain still for some minutes without making any attempt to effect an entrance.

Mode of Entrance.

When a suitable place has been selected by the larva, it is noted to move its head backwards and forwards for some time spinning a mat of fibres. The function of this mat appears to be to provide a more secure foothold for the larva so that it may force its mandibles through the skin of the apple. In addition to this, it was observed that the fibres served to retain the rejected portions of the skin as they were cut out, and so finally to help in covering the burrow.

A number of larvae were observed to reject the pieces of skin as they were cut out and place these portions alongside the entrance. When the skin had been pierced and the burrow deepened a little the larva appears to

ingest the portions cut out in making the excavation large enough to contain its whole body. The larva then turns about and covers the entrance with the previously rejected portions of the apple and excreta, spinning more threads to hold the covering firmly.

The time occupied in these operations was normally one to one and a half hours, both under laboratory and field conditions.

Production of "Stings."

A "sting" is commonly regarded as a shallow excavation or burrow caused by a larva which has ingested a lethal dose of poison and died without producing further injury. Counts of the fruit and injuries produced on ten unsprayed trees showed that 3,218 larvae had made effective entrances and 632, or 16.42 per cent., had produced "stings." The production of stings would, in this case be due to lack of vitality of the larvae, to unfavourable weather conditions, or to predators.

Several hundred newly-hatched larvae were placed on apples which had been sprayed in the laboratory with lead arsenate. Larvae were not observed to commence a burrow and subsequently relinquish it in favour of another site. Numbers of larvae were noted to commence burrows through deposits of arsenate of lead, and their activities slowed quickly, and sometimes the blemish produced was very slight. No instance was noted in this series of tests where an effective entrance was made through a deposit of lead. Field observations and more complete laboratory studies, however, have shown that the larvae have sometimes succeeded in burrowing through such deposits, but that the majority of larvae enter at the edges or between deposits.

In the laboratory, apples were examined after a period of seven days, and it was then evident that the larvae often fed near the surface for a few days before burrowing to the centre of the apple. Considerable variation was also noted in the size of the larvae after this period, and it seems probable that many had received a sub-lethal dose of poison which merely served to retard their development.

The production of a large number of "stings" would indicate effective spraying, except possibly in the case of very quick acting or repellant poisons. It was noted, however, that some larvae made use of stings previously produced in effecting their entrances. This fact, together with the knowledge that a number of stings are produced on unsprayed trees, must be kept in mind when judging the efficiency of the various sprays.

Behaviour of Maturing Larvae.

Frequently a number of larvae were observed to enter a single fruit, but it was unusual for more than two to reach maturity. This suggests that the larvae are cannibals under certain conditions, and this has been borne out by experiences in the breeding jars with matured larvae. It was frequently noted, however, that a second infestation occurred, young larvae developing after the first larvae had left the fruit. Evidence was obtained that larvae may leave the fruit in which they commenced to feed and seek another fruit, so destroying two fruits. This, however, does not appear to be a common habit, and is most likely to occur when two fruits are in contact.

The young larva normally feeds near the surface for a few days before burrowing to the centre of the apple, when it commences to feed upon the pips. The entrance burrow is enlarged and the excreta rejected, until a large amount of frass is apparent at the place of entrance. When about to emerge the larva usually forms another burrow to the surface, which may remain plugged with a mat of silk for several days. The exit hole is usually round and free from frass, and so quite distinct from the entrance.

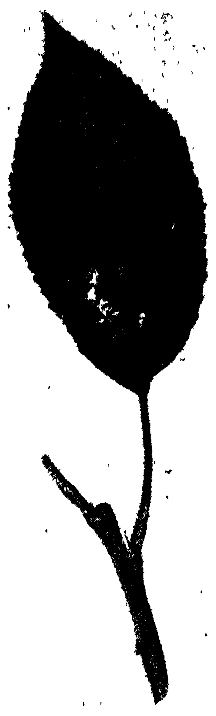


Fig. 1.—Damage to Apple Leaf by Codling Moth.

When an apple containing an immature larva falls to the ground the larva usually continues feeding until it matures. Excessively hot weather may force it to leave the fruit, and burrow in again in a cooler portion. Larvae have been noted to mature in fruit less than 1 inch in diameter, and consequently windfall fruit even of this small size should not be neglected.

Foliage as a Source of Food.

Fifty newly-hatched larvae were bagged on an unsprayed branch bearing foliage only. When examined after fourteen days, three larvae about one-third grown and numerous damaged areas on the leaves were noted. In addition, one larva had commenced to burrow into the end of the terminal shoot. A subsequent examination failed to reveal any living larvae, and it is therefore doubtful whether larvae could reach maturity when feeding on foliage only

Field observations showed that similar damage occurred very occasionally on sprayed trees. This, however, was not as extensive as that recorded on the unsprayed branch on which the larvae were liberated.

Behaviour of Larvae on Leaving Fruit.

No larvae were observed in the act of leaving the fruit on the trees and dropping to the ground by means of a silken thread. Three trees were banded with tanglefoot, and burlap bands were placed above and below these impassable sticky barriers. Of 317 larvae captured in the bandages, 275, or 86.75 per cent., were taken in the three upper bandages, thus indicating that the normal method of reaching the bandages was actual descent down the main limbs, and not by dropping to the ground.

Larvae maturing in wind-fallen fruit would necessarily reach the bandages by ascending the trunks, and in this operation would be very subject to attack by predatory ants and beetles.

The larvae immediately seek hiding places in which to spin cocoons and complete their transformations. It is therefore imperative that any favourable cocooning places, such as cracks, rough bark, &c., should be destroyed if the maximum efficiency is to be gained by the use of bandages.

Overwintering of Larvae.

First-brood larvae.—The majority of the larvae of the first brood transform into moths the same season as they leave the fruit. Thus of 680 larvae under observation, only thirty-six, or 5.29 per cent., did not pupate, but overwintered as larvae.

Second brood larvae.—The majority of the larvae of the second brood proved to be overwintering larvae. During the season 111 second brood larvae were reared, and of these 105, or 94.59 per cent., overwintered.

Third brood larvae.—Only six second brood moths were reared and no third brood larvae were obtained. The third brood of larvae would be relatively small, and would most probably consist only of overwintering individuals.

Bandage Records.

The graph reproduced as Fig. 2 illustrates the occurrence of first and second brood larvae under bandages, inspected every three days, on ten unsprayed trees. The maximum number of first brood larvae was recorded on 16th January. The relatively small second brood of larvae was due to the small number of apples remaining on the unsprayed trees after the severe infestation by the first brood larvae. A very close correlation between the number of larvae in the bandages and the mean average daily temperature for the three-day periods is apparent.

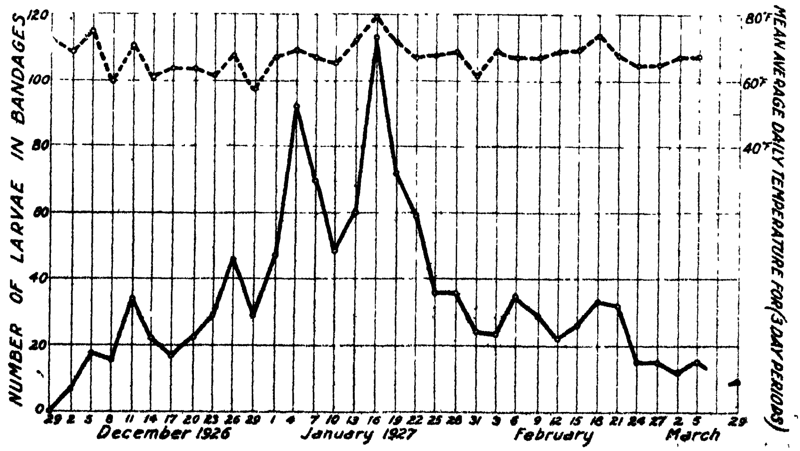


Fig 2.—Occurrence of First and Second Brood Larvae under Bandages on Unsprayed Trees.

The graph forming Fig. 3 illustrates the occurrence of larvae under bandages in the main orchard. The bandages were inspected at frequent intervals, ranging from a minimum period of five days to a maximum period of thirteen days. This irregularity was due to weather conditions and other practical difficulties in the inspection of a large number of trees. These inspections were discontinued for the season on 24th March, when all the larvae under observation appeared to be overwintering.

The occurrence of two pronounced broods are indicated. The earliest second-brood larvae under observation emerged on 5th January, and as the average feeding period was approximately twenty-eight days, the larvae should commence to reach the bandages early in February. This agrees closely with the bandage records obtained.

No definite third brood is apparent, and as only a small percentage of second brood moths transform, and in addition a very considerable overlapping of broods occurs, this is to be expected.

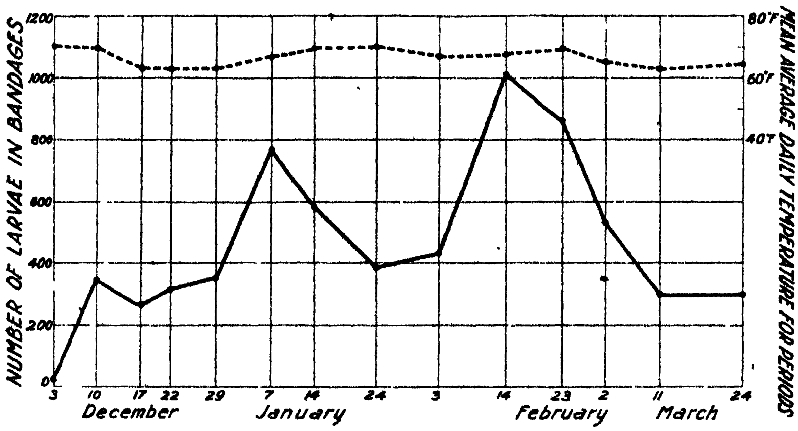


Fig. 3.—Occurrence of Larvae under Bandages in Main Orchard.

Natural Enemies of the Codling Moth.

Parasites.—During the season 1926-27 several wasp parasites of the larvae were collected. These, however, were obtained late in the season and were not present in sufficient numbers to be of economic importance.

Several larvae were attacked by an external parasite which has been identified by Dodd as an undescribed species of the genus *Parasierola,* Kieffer.

An internal larvae parasite, bred out in one of the breeding cages, proved to be *Stomatoceras pomonellae,* Cameron.

The most important parasite recorded was the egg parasite *Trichogramma australicum,* Girault. These specimens were identified by Girault, who has records of this species from the eggs of a butterfly and from several species of moths. As many as three of these small wasps were bred from a single

codling moth egg. Parasitised eggs were not abundant until towards the end of the season, when approximately 27 per cent. of the eggs were destroyed.

Predators.—The larvae of the Green Lacewing, *Chrysopa* sp., were present in numbers, and appeared to feed mainly on the Woolly Aphis, *Eriosoma lanigera.* In the laboratory the larvae were observed to destroy numbers of eggs by piercing the shell and sucking up the juices. It was therefore probable that these larvae were responsible for a considerable destruction of eggs in the field.

A number of predatory beetles were obtained during the inspection of the bandages, and these were identified by Lea. The larvae of the Dermestid Beetle, *Trogoderma frogatti,* Bl., were recorded attacking codling moth pupae. Specimens of beetle larvae forwarded by W. A. Grassick, Cargo-road, and reported to attack the codling moth larvae, proved to be those of the Soldier Beetle, *Carphurus* sp.

The common mound ant, *Iridomyrmex detectus,* Sm., was abundant in the orchard and readily attacked any exposed larvae. Larvae leaving windfall fruit would be most liable to attack as they made their way to the bandages on the trunks. The specimens of this ant were identified by Clark.

SUMMARY.

Numbers of larvae overwintered on the trees under rough bark and in crevices. A small percentage overwintered against the tree trunk and below the surface of the soil.

Overwintering individuals remained in their larval state from 154 to 233 days, and pupated on the average 191.19 days after leaving the fruit.

Spring brood moths emerged mainly between 8 a.m. and 11 a.m. First brood moths emerged over a longer period, but the maximum period of emergence was between 9 a.m. and 10 a.m.

The maximum number of eggs deposited by a single female moth of the spring brood was ninety-eight, of which sixty-six were deposited on one day. The maximum number of eggs recorded for an individual first brood moth was fifty-one, of which forty-two were deposited on one day.

Spring-brood moths deposited the majority of their eggs between 4 p.m. and 6 p.m.

Low temperatures prevented egg deposition, and the critical temperature was approximately 60 deg. Fah.

The majority of eggs laid by the spring brood moths were deposited on the leaves.

Spring brood moths deposited eggs mainly on apple trees in the orchard which contained pears and apples.

The young larvae emerged through holes formed near the periphery of the egg shell.

The larvae burrowed into the fruit from one to one and a half hours.

"Stings" were formed on unsprayed fruit.

Some larvae left the apples in which they commenced to feed and entered others.

Immature larvae did not leave the fruit when it fell, but remained and continued feeding in it till they matured.

Larvae may feed on foliage for some time, but it is improbable that they can mature on such food.

The majority of the larvae gained the bandages by descent along the main limbs.

Some of the first brood larvae did not transform, but overwintered as larvae.

The majority of the second brood larvae overwintered.

Figures 2 and 3 record the occurrence of larvae under bandages on ten unsprayed trees and on the trees of the main orchard. The appearance of two main broods is indicated.

Larval parasites recorded included *Parasierola* sp., and *Stomatoceras pomonellae,* Cameron.

Trichogramma australicum, Girault, destroyed numbers of eggs late in the season.

The larvae of the Green Lacewing, *Chrysopa* sp., destroyed eggs in the laboratory.

The larvae of *Trogoderma froggatti,* Bl., destroyed some pupae, while the larvae of *Carphurus* sp. were forwarded from Cargo-road and reported to have attacked codling moth larvae.

The mound ant, *Iridomyrmex detectus,* Sm., readily attacked any exposed codling moth larvae.

The Progress of Extension Work in U.S.A.

According to the *Journal of the Ministry of Agriculture,* London, agricultural education in the United States of America during the past thirteen years has made remarkable progress through the development of the extension movement. In 1914, the State and Federal Governments were spending 1,600,000 dollars on extension work in agriculture and home economics, and by 1924 this figure had increased to 19,394,639 dollars per annum, of which approximately 12,000,000 dollars were contributed by the States and counties. In the same period, the total personnel increased from 1,230 to 4,764 officers, the latter figure including 765 full-time specialists, extension directors and other supervisory officers.

In determining the policy of the extension work for a district, the farmers, with the agents of the co-operating county, State and Federal Governments, together review the local conditions and agree upon what ought to be done. The administration of the work is then entrusted to the State College of Agriculture. The full recognition of local people, conditions, and practices, and the enlistment of the active participation of the individual farmer and his family in the planning and the carrying out of local extension work, are the two fundamental considerations to which the success is accredited.

Preservation of Whole Fruit with Sulphur Dioxide.

J. M. ARTHUR, Orchardist, and M. S. BENJAMIN, D.I.C., A.A.C.I., Lecturer in Chemistry, Hawkesbury Agricultural College.

SULPHUR dioxide, as well as its various compounds, such as bi-sulphite of potash, bi-sulphite of lime, has long been used for the preservation of wines, beers, fruit beverages, and various articles of food. Sulphur dioxide has also been employed to some extent for the preservation of fruit pulp.

At the suggestion of the Fruit Branch, some experiments were recently carried out at the orchard at Hawkesbury Agricultural College with a view to determining if whole fruit could be suitably preserved under local conditions by the use of dilute aqueous solutions of sulphur dioxide. Similar experiments were some time ago carried out by Barker and Grove at Campden Fruit Research Station, Glos., England, and are described by those workers in a recent issue of the *Journal of Pomology and Horticultural Science* (Vol. 5, No. 1, December, 1925). In the experiments referred to satisfactory results are reported as having been obtained in the preservation of raspberries, blackberries, strawberries, plums, and other fruits by the use of this preservative.

The following is a brief report of preliminary trials at Hawkesbury Agricultural College, and of the results obtained so far with plums and grapes.

Trials with Plums.

Trials with plums were commenced on 13th January, the variety used being Cyca Smomo (a blood plum). Half-gallon screw top jars were used, being filled with fruit of uniform size and maturity.

Aqueous solutions of sulphur dioxide, with concentrations of 0.08, 0.09 and 0.10 per cent. respectively were prepared. These solutions were poured over the fruit contained in three separate sets of jars, which were subsequently labelled sets 1, 2 and 3. After the solutions had been added the jars were tightly sealed, and the contents examined a week later. All the fruit was found to be in good state of preservation, but the skin had become considerably bleached.

The contents of sets 2 and 3 had developed strong acidity, while the fruit in set 1 was only slightly sour. A further examination made two months later showed that the fruit in all the sets was still fresh and sound, and that no fermentation had occurred, but it was still sour, and the skin as well as the flesh had undergone considerable bleaching, so that the latter was now a faint pink colour.

An attempt was then made to see whether cooking would restore the fruit to its natural colour, or diminish its acidity, the tests being—

(*a*) By heating portion of the fruit in an open boiler.

(*b*) By steaming portion while still in its container.

In both cases it was found that the natural colour of the fruit was partly restored by these methods, and that the acidity was considerably reduced. The restoration of the colour was more complete when the cooking was done in an open boiler than when in its container.

The experiments would seem to indicate so far that 0.08 per cent. sulphur dioxide solution was sufficiently strong for the preservation of the variety of plums tested, but it would appear desirable to try the effect of lower concentrations, say, .06 and .04 per cent. of sulphur dioxide on these and other varieties of plums. It is proposed to do this next season.

Trials with Grapes.

Experiments with grapes were also carried out. Four varieties were selected, namely—Gros Moroc (black grape), Gros Guillaume (black grape), Flame Tokay (pink grape), Waltham Cross (white grape).

On 24th February, 1927, three 1-quart jars of each variety were prepared and covered with the preservative solution, as in the experiments with plums. It was thought desirable in the case of grapes, these being more delicate fruit, to try the effect of more dilute solutions of sulphur dioxide. With this end in view, concentrations of 0.08, 0.06, 0.04, 0.01 and 0.008 per cent. of sulphur dioxide, which were labelled Nos. 1, 2, 3, and 4 respectively, were used.

The fruit was examined on 10th March, and it was noted that Nos. 3, 4 and 5 had undergone more or less fermentation. In the cases of Nos. 1 and 2, no fermentation could be detected, but bleaching of the skins in the case of the coloured grapes had occurred. The natural flavour of the grapes had been retained.

On 1st June (over three months after the fruit had been preserved) cooking experiments, on similar lines to those adopted with the plums, were carried out with Nos. 1 and 2, and the original colour of the black grapes was partly restored, but no change took place with the Flame Tokay variety. It remained quite bleached.

An interesting point was noticed with the black grapes. A control jar of grapes that was not cooked, but off which the lid was left, in twenty-four hours developed a similar colour to that of fruit that had been cooked. The probable explanation of this, and of the colour changes obtained when the fruit was cooked, is that sulphur dioxide has a slight reducing effect on the natural pigment found in the fruit, and on the removal of the excess sulphur dioxide, which is brought about when the fruit is heated or simply aerated, a re-oxidation of the pigment substance occurs, and the fruit is restored wholly, or in part to its natural colour.

The changes observed naturally lead one to inquire whether, apart from its preservative action, sulphur dioxide has any direct chemical effect on other constituents of the fruit. In connection with this point it is interesting to note that some studies—vide *Journal of Pomology and Horticultural Science,* Vol. 5, No. 1, December, 1925—have been carried out lately by Appleyard at the Campden Research Station, England, dealing with

this aspect of fruit preservation with sulphur dioxide. It was found that the enzymes present in the fruit were inactivated by treatment with the preservative, just as such enzymes are inactivated or destroyed when the fruit is boiled during the process of manufacture into pulp. It has also been observed that the fruit so treated undergoes some loss in "jelling" powers when used in the manufacture of jam.

Further trials with different fruits and varieties are necessary in order to determine how far the method described is applicable and practicable under Australian conditions. If it should be found from subsequent investigations that ordinary varieties of Australian-grown fruits could be satisfactorily preserved in this way, this process would seem to compare more than favourably with other methods of fruit preservation in common use. It would, for example, allow of fruit being kept and marketed in a more attractive form than when it is reduced to pulp.

Apples, for instance, could be preserved whole or in sections, instead of being reduced to pulp, and the product would probably command a higher market value. Moreover, the preserved product could be used as an article of food in the same way as bottled or canned fruit, and the labour and time involved in its preparation would be considerably reduced. In addition, surplus fruit obtained during a glut season could be stored and profitably utilised for jam manufacture, the labour and time involved in its preservation being less than that required to preserve it, as at present, in the form of pulp.

To Obtain Maximum Milk Production.

Every dairy cow inherits a fairly definite maximum capacity as a producer. The only accurate way to determine this is under the most favourable conditions as regards feeding and management. Many high producers were never discovered because they were never given a chance to show their ability. There are many factors to be considered in obtaining maximum production, and success depends mainly on the cow, but the feeder and milkers are important factors.—G. McGillivray, Hawkesbury Agricultural College.

Perfect Your Cows by Testing and Selecting.

Beyond doubt, heavy producing qualities are hereditary, and when we mate the progeny of high-producing cows, that quality becomes intensified. Skilful breeding does not necessarily create new traits; it selects and concentrates, and so intensifies. Testing has made it possible to segregate high-producing blood, and there is reason to believe that by selecting we shall, before long, have the perfect high-producing animals that will breed true for high production. But we will not accomplish this without the continual use of the tester which enables the low-producing families to be discerned.—A. J. Gill, in the Victorian *Journal of Agriculture*.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

***Maize*—**	
Golden Glow	P. Kelly, Leech's Gully, Tenterfield.
Fitzroy...	Manager, Experiment Farm, Grafton.
Broom Millet	W. T. McDonald, Taree Estate, Taree.
***Grasses*—**	
Sudan Grass	C. Bennett, Forbes-road, Cowra.
***Sweet Sorghums*—**	
Collier	Manager, Experiment Farm, Grafton.
Selection No. 61	Manager, Experiment Farm, Grafton.
Saccaline	Manager, Experiment Farm, Wollongbar.
	D. Shearer and Sons, Glendon, via Singleton.
White African...	Principal, H.A. College, Richmond.
***Peanuts*—**	
Large White Spanish... ...	Manager, Experiment Farm, Grafton.
***Soybeans*—**	
Biloxi	Manager, Experiment Farm, Grafton.
Otootan	Manager, Experiment Farm, Grafton.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Quality or Quantity in Export Lambs.

The question is often asked, "Which is the most important factor in catering for the export lamb trade—quality or quantity?" In this respect I am referring to the individual lamb and not to the quantity of lambs which might be brought forward for export. I have studied the export market closely, and have made inquiries of many of the Homebush selling agents, export lamb-buyers, and others connected with the trade, and the general consensus of opinion is that quality should at all times be given preference to quantity. Quality is the ruling feature in the lamb trade; it is the first consideration when orders are being discussed; in fact, if buyers could procure lightweights, 25 to 35 lb., showing sufficient quality, the demand for the heavier sorts would be even less than it is to-day.—F. B. Hinton, at the Agricultural Bureau State Conference.

Poultry Notes.

NOVEMBER.

JAMES HADLINGTON, Poultry Expert.

THE peak of egg production has now been reached, and on many farms it will have passed by the time these notes are published. In so far as hens are concerned, falling off in egg production generally will commence now and continue from this month onward. At the same time it is not advisable to be too severe in culling out hens to send to market, simply because some are having a spell or are laying a reduced sequence of eggs. Every year thousands of hens are marketed in November and December which would have been very profitable if kept. The volume of egg production during the slump that not infrequently takes place for a couple or three weeks following period of the peak production may not be a criterion of average expectations for December and January. Not only so, but prices for eggs invariably harden during these months.

Only two factors enter into the question whether or not any number of hens should be disposed of during the months mentioned; one is where the room is required to accommodate pullets of the season's hatching, and the other is the difference in prices likely to be ruling before and after the end of the year. It is, therefore, in many cases a matter of judgment on the average expectation of laying, together with the difference in prices likely to rule for hens before and after—taking into account the cost of feeding and price of eggs. This is a case in which no rule of thumb will apply, and in which every case has to be judged in the light of the factors mentioned.

Mistakes in Feeding Hens.

How easy it is for poultry farmers to leave the track of sound practice and get into by-ways that lead to loss and sometimes disaster to their farms, is shown by practices one frequently comes across on the farms. In no operation is this more typified than in that of feeding. During the flush season of production last year, many cases of errors in feeding came under observation which had cost the farmer dearly, both in reduced production and in a high rate of mortality. The loss in production in some cases was almost staggering, and all because some error had crept into either the method of feeding or the feed itself, mostly in the methods adopted.

One pretty general error which is found to be creeping into the feeding of laying stock (and for that matter growing stock as well) might be mentioned—the practice of feeding wet mash in the morning and supplementing this with dry mash to which the hens have constant access. It is one of the most pernicious systems one could devise. The practice leads to the hens being surfeited with food to such an extent as to get them

into a stagnant state of health, and the effect is usually to bring the number of eggs laid for the extra feed fed lower than if the birds were fed rationally by either the wet or the dry mash system. It is not my desire here to condemn dry mash or to advocate wet, but to point out the inadvisability of having dry mash before the birds all day when a full feed of wet mash is given in the morning.

It is quite a different thing, where the dry mash system is in use, to give a little wet mash at some time in the day, preferably in the forenoon. This practice gives better results than wholly dry mash feeding, because the little bit of wet mash is then supplementary to the dry, and is a desirable adjunct, because the birds eat scarcely sufficient dry mash for their requirements, owing principally to its lack of palatability.

Art in Feeding.

It should be realised that there is an art in feeding poultry altogether apart from the class of food fed. That art lies in feeding all the food the birds will eat and yet continue keen for food without under feeding. My advice on feeding in a general way has always been to feed full and plenty, but that should not be construed into surfeiting the birds with food to the point of laziness and ill condition—else what skill would there be in the actual operation of feeding!

The fact is, there are feeders and skilled feeders, and it is the latter class who get the results in egg production at less expence than the unskilled feeders. The unskilful feeder is generally looking for some nostrum to make his hens lay, quite oblivious of the fact that it is often lack of skill that is responsible for his failure. It is a matter of general experience that one feeder will get more eggs from a simple ration composed of wheat, maize, pollard, and bran, with the addition of a little meat or meat concentrates, than another will secure by all the expensive foodstuffs and extras which are available, and when there is failure to get results the strain or something else is blamed for it. There is a disposition to reduce labour in feeding and attention below what is legitimate and necessary to secure good results. More time spent in feeding will repay the farmer many times over. This really has been the most outstanding feature with the most successful men with poultry, whether on commercial farms or in show pens. It is an aspect of the business that has been fully recognised by all the best breeders in all times, not alone with poultry but with all kinds of stock.

It can be taken as a general axiom that birds should be ready and eager for every feed, and particularly so for their morning feed. Birds that hang back from their feed will not long continue to lay, and the giving of their food should be so regulated as to bring about this desirable state of health.

In the case of big flocks the condition of surfeit described may apply to only that portion of the birds which is of perhaps mixed ages. If the birds can be divided according to age, the feeding will be simplified, but in any case one can be sure that there is only one way to keep birds laying, and that is to keep them always keen for their food and yet well fed.

The period is now approaching when the layers are most susceptible to being surfeited with food. Towards the end of October or the beginning of November there generally occurs a slackening off in production, principally due to the fact that some of the hens are taking a short spell after a couple of months of very high production. Naturally these hens then eat somewhat less, and if the usual quantity of food is given the whole flock becomes surfeited. This in turn brings about further cessation in laying, and the trouble becomes cumulative. This means that the farmer should be ever on the alert watching the feeding of his flock, and especially at this time of the year when there is a decline from the maximum quantity consumed—otherwise a big drop in production will follow a surfeit of food.

It is equally important, however, that there should be no swing to the other extreme, with under feeding. This is quite as bad and will bring about the same result. The remedy is to devote more time to feeding, in order to meet the changed condition in respect of the amount of food consumed by the flock.

Green stuff is another source of likely trouble. Only succulent green food should be fed to poultry at any time, but as summer approaches there is much tough and even dead matter usually present in the green stuff. It should be remembered that all such unsuitable material is a source of danger, because it is not only indigestible but is the main cause of such troubles as sour crop.

There is no part of a poultry farmer's duties so simple, and yet fraught with such potential consequences as that of feeding, yet it is often delegated to persons who have not cultivated the faculty of observation to the extent that would constitute them good feeders.

What it Means to Feed "Full and Plenty."

In connection with this discussion on feeding, it will be remembered that in a general way the feeding of "full and plenty" has always been advised in these notes, and in all literature issued from the same source. Obviously, however, this advice has special reference to systems in which the food is fed to the birds in regular feeds, as, for example, where wet mash is fed in the morning and grain at night, with a little "catch up" of, say, green stuff at midday, with perhaps a few hands full of pollard mixed with it. In this system it is necessary that the birds be given all they will eat at each of the main meals, morning and evening. It is in this sense that the term "full and plenty" is used.

The term appears, however, to be confused with stuffing the birds with food every minute of the day. There is only one worse fault in feeding than this, and that is giving them insufficient for their requirements. It might be argued, and with some justification that dry mash feeding in conjunction with grain in the evening gives good results, but there are factors which should not be overlooked.

Even if we admit that another system of feeding will give better results, the question of adopting one or other of the systems may (and in many cases is) determined by the circumstances in which poultry farmers find

themselves in respect of suitable labour, or their own special conditions. Thus it is that we have many dry mash feeders, not so much from choice as from necessity. I have often been constrained to point out that many poultry farmers who lack the necessary skill or aptitude to feed on wet mash in the way in which it should be fed, are much better off feeding dry mash. One is therefore not inclined to be too dogmatic on this subject. One thing, however, should be understood—dry mash alone is not sufficiently appetising, and the birds rarely eat sufficient of it to enable them to do their best in production and to maintain weight. It is this that has led to the introduction of sugar to the mash in some laying competitions where dry mash is a feature in feeding, but it is not a practice that can be recommended to poultry farmers. Indeed there are very great objections to feeding sugar to poultry in any form.

The main outstanding point, then, in all this is that while a little wet mash given during the forenoon as a supplement to dry mash is not only permissible but advisable, the feeding of a full feed of wet mash, with dry mash constantly before the birds, is to be condemned as unsound and leading to loss in production and often loss of condition.

A Method of Drenching Sheep for Fluke.

The carbon tetrachloride treatment of sheep for fluke has now received general acceptance, and the following method of administering the drug in paraffin has been found satisfactory:—The sheep should be placed in a branding race, and not packed too tightly, and two men should work in the race, as one operator can keep both going. A man holds a sheep's muzzle still by keeping his hand under the jaw, and the operator places the nozzle of the syringe in at the corner of the mouth where it will reach well back, and forces the fluid out of the syringe at a reasonable rate without squirting in too fast. The sheep immediately swallows and there is no waste. It is not necessary to open the sheep's mouth—in fact, it is better not to. Time is saved by having some one to carry the fluid and follow the operator along the race. About 250 sheep per hour can be done in this way.—E. A. Lucas, Inspector of Stock.

According to a recent press report, the problem of commercial utilisation of maize stalks is believed to have been solved after many years of effort. The process of Dr. Bela Dorner, a Hungarian chemist, has been brought to the United States, tested by experts, and pronounced practicable and economical. By this method artificial silk has been produced from maize stalk pulp. The technical obstacles have been the pith and knuckle of the stalks, which could not be removed economically. The Dorner process grinds up the entire stalk, which means that it is possible to convert a waste material into abundant supplies of pulp for making paper, artificial silk, motion-picture films, explosives, celluloid, lacquers, artificial leather, pyralin, and other products. By-products of the Dorner process can be used in the manufacture of alcohol, cattle feed, butanol, furfurol, lactic acid, &c. These by-products will be an additional revenue.

Orchard Notes.

NOVEMBER.

W. J. ALLEN and W. LE GAY BRERETON.

IN tableland apple and pear districts it is generally about a fortnight before Christmas that the tiny grubs of the codling moth are found mining their way into the fruit. These grubs are the progeny of the carry-over grubs from the previous season. Some will doubtless be poisoned by the lead arsenate spray previously applied, but quite a number escape and go through their life cycle and as moths lay the eggs for the second brood.

Hence it is important to keep a close watch on the young fruit in December, and when the tiny grubs show up to start a systematic hand-picking of apple and pear trees. To do this work satisfactorily a suitable ladder or stool must be used in examining trees that are so high that they cannot be conveniently reached from the ground. When the work is done thoroughly it is one of the most effective ways of checking the activities of the first brood, and it is absolutely necessary if it is intended to clean up an orchard that has been allowed to become badly infested.

A close watch must also be kept on the bandages, and infested fruit should be promptly destroyed by boiling.

The fruit is growing quickly at this period, and frequent applications of lead arsenate spray should be given to protect it as far as possible. Where early fruits are being marketed and cases are being returned from the market they must be examined to ensure that fresh grubs are not introduced from outside.

It is only by attacking this pest at every vulnerable point that it can be kept down, for it is in very few, if any, of the apple and pear districts of this State that it can be held by spraying alone.

Fruit Fly.

Growers in districts where fruit fly is troublesome should read the report on trials of poison baits carried out by the Entomological Branch, which was published in the September issue of the *Agricultural Gazette*. The results so far obtained indicate that poison baits offer an auxiliary method of combating the pest, and fruitgrowers in affected areas should prepare to make use of baits later in the season. It must not be assumed, however, that baiting can take the place of regular collection and prompt destruction of infested fruit. In fact, the report shows most clearly that this must be faithfully carried out.

Apple Leaf Jassid.

When this insect is present in large numbers it does more damage than is often realised. The immediate harm caused by the excreta on the fruit is very apparent, but the sapping of the foliage is probably more serious, as if

a big proportion of the foliage fails to function the tree is partially starved, and will fail to form good buds and stores of food, and consequently the prospects of a satisfactory crop the next season are lessened. Growers should therefore keep an eye open for this pest. If it appears, spray at once while it is still in the larval stage with nicotine sulphate. Once it changes to the winged stage sprays are of very little advantage.

Fungous Diseases.

Generally speaking, conditions have not been favourable for the development of fungous diseases this spring, but should continuous showery weather occur precautions should be taken against a late outbreak of black spot of apple and pear in localities liable to this disease. The same applies to black spot of the grape vine, and more especially to downy mildew of the grape vine. In fact, in districts where this disease has occurred before it is safest to put on a precautionary application of Bordeaux mixture.

Cultivation.

Up to the time of writing there have been no very soaking falls of rain in most fruit districts, and an endeavour should be made to keep the soil in a condition in which it is capable of absorbing any rain that falls. Should rain come, the ground should be worked as soon as it is dry enough, in order to reform the mulch and keep down all weed growth.

Summer Training.

It is necessary during the spring and early part of the summer to look through young deciduous trees periodically, and to direct their growth by pinching back the growing points of leaders which are outstripping their neighbours. This keeps the growth even.

When the leading shoots of young trees are extending very fast, it is sometimes necessary to pinch them back to prevent them being broken out, or blown out of shape by heavy winds. Care should be taken when doing this that the shoots are not cut or pinched back below the tender growth, as if the more mature woody growth below is cut into there is a liability to permanently stunt some kinds and varieties of fruit trees. Even with vigorous older trees it may be advantageous to thin the growth to some extent to allow more light to penetrate through the tree.

This work must be carried out carefully, and it is far better to underdo it than to overdo it. If shoots are thinned out to too few the remainder are far more liable to be destroyed by winds. Superfluous shoots toward the centre of upright growing trees encourage the desired shoots to grow with more outward spread. Moreover, it should never be forgotten that the leaves are the lungs and digestive organs of a plant, and any reduction of foliage checks the growth of the plant.

Trees that have been reworked by budding or grafting require the same care as the young trees, but though strong shoots from the stock must be checked or entirely removed if they are sapping the growth from the buds

or grafts it is a distinct advantage to leave as much foliage as possible. A leaflet is obtainable from the Department on the after care of buds and grafts.

Citrus Trees.

As the wall of foliage of orange trees extends, small growths nearer the centre become smothered and gradually perish. Now is a good time to remove this perishing wood from the centre.

Supplies of fertilisers should be procured for the midsummer applications.

Marketing Empire Produce.

The Empire Marketing Board, appointed last year upon the recommendation of the Imperial Economic Committee, has issued its first annual report. According to this document, it was early realised that "it is no good telling the public to buy Empire produce unless it is obtainable in the shops, good in quality, and reasonable in price. Much Empire produce already fulfils these three requirements, and has found its own secure market; but, in many parts of the Empire, producers have not yet had an opportunity of acquiring the market experience of the older countries with which they must compete. Every year, too, brings new Empire products to the doors of the world's markets. The best service that can be done to the Empire producer is to place freely at his disposal the resources of science and economic investigation—to see that he is made aware of the latest methods of sowing and planting, of tending and harvesting; to show him how his produce should be graded and packed to ensure that it is transported safely and without deterioration; to suggest, lastly, how its presentation in the shop window or on the counter may be fitted to win the housewife's critical eye."

With this outlook upon its functions, the Board has conducted its first year's operations under the three main headings of scientific research, economic investigation, and publicity. The Board has made no attempt itself to engage directly in scientific research, but has done its part in fortifying existing scientific institutions to enable them to intensify and develop their work, and in making possible the establishment of new institutions to meet new and proved needs. Among many useful activities on these lines mentioned in the report are contributions toward the expenses of a visit of a representative of the Australian dried fruits industry to England to make a thorough inspection of the marketing of dried fruits in the various centres, and toward the cost of sending a special mission to Australia to consult with the Commonwealth Government upon the opportunities of development and extension of trade between Great Britain and the Commonwealth.

As to publicity, the Board has conceived its main function to be that of creating a background against which individual Governments or trading interests can throw into relief the claims of the particular commodities in which they are interested. In this connection it has made use of newspapers, posters, exhibitions, Empire shopping weeks, window dressing competitions, lectures, and literature.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1927.

Society and Secretary.		Date.	Society and Secretary.		Date.
Lismore (H. Pritchard) ..	.. Nov.	16, 17, 18	Grafton Summer (L. C. Lawson)	Dec.	2, 3
Orara (H. E. Hindmarsh)	.. ,,	29, 30	Albion Park (H. R. Hobart) ..	,,	31, Jan. 2

1928.

Society and Secretary.		Date.	Society and Secretary.		Date.
St. Ives (F. Conway) ..	.. Jan.	12, 13	Nimmitabel (R. Draper) ..	.. Mar.	5 to 8
Dapto (E. G. Coghlin) ..	.. ,,	13, 14	Tumbarumba (M. Kinstler)	.. ,,	6, 7
Bangalow (W. H. Reading)	.. ,,	25, 26	Taree (R. Plummer) ..	.. ,,	7, 8, 9
Gosford (E. H. Fountain)	.. Feb.	10, 11	Moss Vale (W. Holt) ..	.. ,,	8, 9, 10
Leeton (W. Roseworn) ..	.. ,,	14, 15	Gundagai (P. J. Sullivan)	.. ,,	13, 14
Cessnock (D. B. McGilvary)	.. ,,	16, 17, 18	Crookwell (P. R. Marks)..	.. ,,	13, 14, 15
Castle Hill (W. H. Taylor)	.. ,,	17, 18	Armidale (A. McArthur)..	.. ,,	13 to 16
Newcastle (E. J. Dann) ..	. ,,	21 to 25.	Kempsey (N. W. Cameron)	.. ,,	21 to 23
Dorrigo (J. H. Skeoch) ..	.. ,,	28, 29	Blayney (J. H. Moore) ..	.. ,,	27, 28
Tumut (H. Mount) ..	.. ,,	29, Mar. 1	Sydney Royal (G. C. Somerville)	April	2 to 11
West Maitland (M. A. Brown) ..	,,	29 to Mar. 3	Grafton (L. C. Lawson) ..	.. ,,	25 to 28
Nabiac (E. A. Carey) ..	.. Mar.	1, 2	Kyogle (D. Campbell) ..	.. May	9, 10
Robertson (J. K. Hamilton)	.. ,,	2, 3	Wagga Wagga (F. H. Croaker) ..	Aug.	21, 22, 23

FALLOWING AND NITRIFICATION.

IT is well known that bacterial and chemical forces are more active in well fallowed soil during the summer months than in soils not so treated, and this leads one to believe that the lower yields on land which has not been fallowed, in districts which enjoy, say, a 20-inch rainfall or more, are due to the fact that during the summer months preceding cropping, the soil has not been in a satisfactory condition to allow bacterial and chemical forces to function to advantage; this factor may have a greater influence on the reduction of yield than the insufficiency of moisture during the growing period. Sievers and Holtz, in studies of silt loam soils and their yields in Eastern Washington (U.S.A.), came to the conclusion that moisture conservation under fallow practices serves its primary purpose in the elaboration of nitrates. They specially state that available soil nitrogen, and not total soil moisture, is the limiting factor in crop production in that region, and that the real basis for fallowing is to produce the maximum amount of nitrogen ready for plant use.—R. HILL, in the South Australian *Journal of Agriculture.*

SEVERAL students of Hawkesbury Agricultural College, having completed the College Diploma Course, are desirous of gaining further practical experience, and will be available for positions at the end of the year. These students, who are about 19 to 21 years of age, have received a thorough grounding in the theory and practice of agriculture during the three years they have been in residence at the College, and can be recommended to station-owners and farmers desiring such services.

Some of the College students are also desirous of making use of the midsummer vacation (extending from 15th December, 1927, to 25th January, 1928), to gain practical experience on approved farms. These students are about 17 to 20 years of age, and would be glad to hear from possible employers.

Those desirous of obtaining the services of either students or ex-students might communicate direct with the Principal of Hawkesbury Agricultural College, Richmond.

Agricultural Gazette of New South Wales.

Wheat Grading.

A CRITICISM OF THE F.A.Q. SYSTEM.

E. HARRIS, Wheat Commissioner, and Manager, Government Grain Elevators.

THE establishment of a system of handling wheat in bulk through the grain elevators has made it necessary to review the methods under which the quality of our wheat has been determined in the past and cargoes bought and sold abroad. It is becoming more apparent every season that the rough-and ready so-called f.a.q. system is unsatisfactory both to the growers and sellers. No complaints come from the buyers, so it may be assumed that they at least do not suffer any loss under it.

Bulk handling is slowly but surely extending throughout the State. The warmest advocates of grain elevators are those growers who themselves have experienced the advantages of the system. A very large number of applications for the erection of new elevators at country stations is constantly being made to the Government, and there are not sufficient funds available to satisfy requirements.

Within a few years the change from bag handling to bulk handling has been effected in a third of our entire wheat crop, although we have elevators at only sixty-six stations of the 389 at which wheat is received. New South Wales consumes a large quantity of wheat locally in the shape of flour, and the flour millers have also adapted their plants so that they may receive wheat in bulk, and some four or five million bushels are delivered to them annually from the elevators in this way. The most striking advance appears in the export trade, for 50 per cent. of the wheat exported from New South Wales is now shipped in bulk through the Sydney terminal elevator.

In the buying and selling of produce it is necessary that there should be a standard of quality which the seller must observe when delivering to the buyer. In the case of Australian wheat a buyer may be in England or some other European country, and as the quality of the grain naturally affects its value, there must be some agreement between the seller and the buyer as to the standard of quality of the wheat which the seller will deliver against his sales contract.

The contracts between the Australian exporter and the English importer of wheat are those which are formulated by the London Corn Trade Association. Different forms of contract are in existence for cargoes by sailing vessels, steamers or power vessels, and for parcels. The contracts provide for the buying and selling of a cargo or parcel of wheat—

(1) Of fair average quality of the season's shipments at time of shipment; or

(2) To average at time of shipment about equal to the official standard of the Chamber of Commerce of the State whence shipment is made of the crop (1926-7) adopted by the London Corn Trade Association.

In cases of dissatisfaction on the part of buyer as to the quality of the cargo, the conditions of the contracts provide the appointment of two arbitrators—one on behalf of the buyer and the other on behalf of the seller—the two arbitrators having power to appoint a third. These arbitrators must be principals engaged in the corn trade as merchants, millers, factors or brokers, or directors of a company so engaged, and shall also be members of or partners in a firm, directors of a company, members of the London Corn Exchange, the Baltic, or the London Corn Trade Association, and reside in the United Kingdom. It will be seen therefore that an Australian seller is under a considerable disadvantage in a matter of arbitration as to quality. The London Corn Trade Association also has rules setting out the manner in which samples used for arbitration purposes are to be taken.

Cargoes shipped in the early part of a season are purchased by buyers abroad before the fair average quality has been fixed by the Chamber of Commerce here, and they are practically in ignorance of the quality of the wheat they are purchasing. Hence the purchase is somewhat of a gamble so far as quality is concerned, but one may be sure that the buyer when quoting his price amply covers himself against probable low quality.

How the F.A.Q. is Fixed.

The method of fixing the f.a.q. may be described. The wheat harvest may commence to be delivered by farmers to railway sidings as early as the latter half of November, commencing in the northerly and westerly portions of the wheat area, and gradually extending southwards and eastwards.

Early in December the Sydney Chamber of Commerce circularises wheat shippers, millers, and the grain elevator management, asking that arrangements be made for the collection of samples of wheat through the agents in the country. It is asked that samples should be fair average of the district of about 10 lb. and as delivered to the local railway station; and that the sample should reach the Chamber of Commerce by 15th January.

It may happen that after the first batch of samples has been despatched, rain occurs over some of the wheat districts and has a bleaching effect upon the grain remaining unharvested. Such an occurrence happened during the 1926-27 season, when on 17th January, 1927, the Chamber of Commerce asked for further samples showing wheat harvested before and after the rains. After a preliminary examination by the grain section of the Chamber of Commerce to determine that all the samples forwarded were of millable quality, it was decided, following the usual practice, to base the quantity of the sample wheat from each district on the estimate of the crop in that district. Samples were therefore used representing the north (one-tenth), the west (three-tenths), and the south (six-tenths), and incorporated therein was 10 per cent. of bleached southern wheat and 5 per cent. of bleached western wheat.

In creating the three district samples representing south, west, and north, it is noticed that no attempt is made to fix the size of the individual samples to represent quantities. For instance, one 10-lb. sample may come from a

station with 10,000 bags, and another 10-lb. sample may come from a station with 100,000 bags, and it is apparent that many stations are entirely without representation at all.

After the sample has been well mixed, ten Imperial bushels by measure are weighed over a McQuirk's scale, and the average of these ten weighings practically represents the chondrometer weight of the season's wheat. This chondrometer weight is apparently the principal factor in the fixing of the f.a.q. sample.

Defects of the System.

For the current season 1926-27, 239 samples were sent in, and as in many cases two or even three samples were forwarded from different agents at the same station, it is clear that the samples did not cover 239 stations. Wheat was actually received at 389 railway stations and sidings, and as frequently the quality of the wheat at one station varies considerably from the wheat at another station only a few miles distant, it cannot be claimed that the samples are truly representative of all our wheat crop.

The proportion of wheat making up the bulk sample from each district is determined upon the Government Statistician's estimate of the wheat crop in each of those districts. For instance, this year (1926-7) the proportions were 59 per cent. south, 27 per cent. west, and 14 per cent. north. This was on an estimated crop of (approximately) 47,000,000 bushels. Railway statistics show that only 36,562,000 bushels have been delivered to railway stations. The northern sample this year was an exceptionally good and bright one, but a large quantity of this grain has gone either to Queensland or to local millers, so that merchants and exporters have not the benefit of the addition of this good wheat to their shipments as they are entitled to under the f.a.q. system.

Even though we accept the f.a.q. sample as truly representative of our crop, it is quite impracticable to make a shipment containing 14 per cent. northern wheat, 27 per cent. western, and 59 per cent. southern with a mixture of bleached wheat 5 per cent. west and 10 per cent. south. It is impossible to obtain such a sample of bulk wheat through the grain elevators. This season 12,750,000 bushels of wheat were handled in bulk through the elevators, and the proportion of this wheat compared with the f.a.q. mixture was as follows:—

	F.A.Q.	Bulk Wheat.
Northern	14 per cent.	Nil.
Western	27 ,,	16 per cent.
Southern	59 ,,	84 ,,
	100	100

The impracticability of the scheme is more pronounced when we endeavour to execute an order for, say, 10,000 bushels for a certain mill. The entire order would be fulfilled from one, or, at the most, two stations, and there is absolutely no chance of proffering such a mixture of wheats as is included in the f.a.q. sample. There remains always the danger of the wheat from stations at which the quality is not too good being rejected,

although this poorer quality may have been duly represented in the f.a.q. sample. It is, of course, a known fact that buyers for mills generally operate only at stations at which the wheat is of specially good quality, and the delivery of large quantities of specially selected wheat to mills must assuredly affect the average quality of the remainder.

This year the f.a.q. standard was fixed on 31st January, by which time practically all the crop had been harvested, and one and a quarter million bushels had been shipped overseas. That is to say, we receive all the wheat from the growers without knowing what the standard for the year will be, and sell a considerable quantity overseas on the same lack of knowledge. It is a certainty that such a procedure is against the interests of the grower and in favour of the receiver and buyer who take care to protect themselves by wide margins either in quality or price.

Arbitrations abroad for quality have been uncommonly frequent during the current season, ranging from 1½d. to 6d. per quarter, while the reasons given for the reclamations are somewhat vague, and not at all satisfactory when the shipping sample taken at this end is compared with the official f.a.q. samples. I have had milling analyses made of the cargoes arbitrated against, and have proved them of equal or greater milling value than the f.a.q. sample. Local mills willingly accept wheat of similar quality.

The only stated qualification of f.a.q. wheat is the chondrometer weight, and the only other test to which a parcel could be put would be an actual comparison with the official sample for similarity in appearance. To work on exact lines, therefore, we should be reduced to the absurdity of providing all parties concerned with Chamber of Commerce samples of f.a.q. wheat, each containing the prescribed mixture of 59 per cent. southern wheat, 27 per cent. western wheat and 14 per cent. northern wheat, with 10 per cent. bleached wheat added to the southern grain, and 5 per cent. bleached wheat added to the western grain.

The merchants are beginning to realise that something more definite than f.a.q. is required to protect their trading.

A Comparison of Australian Sales of Contracts with Others.

To show the weak position occupied by the Australian wheat trade on the English market, the forms of contract in force for Canadian and United States grain may be quoted in comparison with the Australian contract I have already referred to. The American contract provides that quality shall be—

(1) At time and place of shipment about as per sealed samples marked .... in possession of........, or

(2) Official........certificate of inspection to be final as to quality.

Generally, the official grades are dealt in, and so long as the wheat passes the official inspection at port of shipment, and is given an official certificate on being shipped, there can be no further dispute at the port of discharge. Contrast this with Australian conditions, under which the seller is not free

from responsibility until the buyer has taken delivery at port of discharge. The seller is also put to the expense of maintaining representatives at such ports.

The Argentine (or La Plata) form of contract provides an alternative to the fair average quality, in a quality described as having

> "Natural weight of........lb. per bushel, guaranteed at time and place of........ to be ascertained and determined according to the rules of the London Corn Trade Association for the description of grain sold."

Wheat is quoted in the London market under the following names:—

American.	Argentine.	Canadian.	Australian.
Hard Winter.	Heavy.	No. 1.	......
Red Winter.	Medium.	No. 2,	......
Durum.	Light.	No. 3.	......
Pacific.		No. 4.	......
		Feed.	

It will be noted that Australia is the only country in the world whose wheat is sold on a single grade.

The Grades Proposed for Australian Wheats.

It is clear from the above that the time has arrived when Australia must follow in the steps of other wheat exporting countries, and institute a system of wheat grades with fixed standards whose characteristics can be described in plain language. There are certain distinctive differences in varieties of wheat which fortunately can be utilised for grading purposes. For instance, in the matter of colour, we have red wheat and white wheat. It is most necessary to keep these two varieties separate for export, as the presence of a quantity of red wheat amongst Australian white wheat depreciates the value of the latter, although our local millers are very pleased to get the harder varieties of red wheat.

The wheat we export is the so-called white description (it is really amber coloured), and this again (as well as the red wheat) is divisible into two classes having a distinct difference in value for milling purposes, viz., hard and soft. The hard wheat can be described as being translucent or vitreous in character, and would include such varieties as Comeback, Bobs, Minister, Florence, Marquis, and Hard Federation. The soft varieties, of which Federation is the principal representative, can be described as white wheat, which is opaque in character.

The second-class might be called "Australian White Wheat," and the first-class "Australian Hard White Wheat." Each class is capable of subdivision further into a number of grades of which chondrometer weight, freedom from smut, objectionable odour, and damaged grain shall be the requirements. An important factor must be the cleanness of the grain, that is, freedom from dust, dirt, chaff, straw, weed seeds, and similar material, which is known in America as "dockage." Our wheat under a grading system must be guaranteed to contain not more than, say, 1 per cent. of such dockage.

For export purposes we could therefore satisfy requirements with, say, three grades—

Australian No. 1 *White Wheat,* to consist of at least 95 per cent. of sound white milling grain, opaque in character, free from any commercially objectionable odour, with a minimum chondrometer weight to be determined on. A stated percentage of bleached wheat and smut balls to be allowed.

Australian No. 2 *White Wheat,* to have similar grade requirements, but a chondrometer weight of, say, 3 lb. per bushel lighter.

Australian No. 1 *Hard White Wheat,* to have similar grade requirements, but to consist of at least 95 per cent. of grain translucent or vitreous in character, and chondrometer weight equal to No. 1 White.

The cultivation of red wheat is not encouraged, but last season some 326,000 bushels were delivered to the elevators alone. It would therefore be necessary to fix some grade requirements for this class of wheat, all of which goes into local consumption.

An important requirement of all grades would be that of freedom from dirt and foreign material, the presence of which in our wheat to-day is so often adversely commented on.

The Wheat Act, 1927, makes provision for the promulgation of wheat standards, and when this shall have been done, provision is made for the creation of special grades in any year when it is found that a considerable portion of the wheat of that particular harvest cannot for any reason be included in any of the permanent grades already established.

The duty of determining the grade standards will be placed on a Wheat Standards Board to consist of a miller, a shipper, two growers, and the Wheat Commissioner.

"Grass Land: Its Management and Improvement."

Without concerning themselves much about individual experiments, Professor Stapledon of the University of Wales and Mr. J. A. Hanley of Bristol University have discussed the principles underlying the management and improvement of grass land in plain terms that occupy 150 pages. It is inevitable, with the immense variety of soils and other conditions that affect pastures, that any suggestions must be tentative and general, but the object of the writers is to indicate to the progressive farmer in what direction he should experiment for himself on his own property. The work is chiefly occupied with English conditions, and its utility in this country is therefore limited, but we at least gather that pasture problems in that old land are similar to our own when we read: "Phosphates are by far the most important manures for grazing land, and in nine cases out of ten the farmer is right in choosing phosphates and phosphates alone."—Published by the Clarendon Press, Oxford.

Comparative Grazing Trials on Top-dressed Pastures.

MILVALE, PARKES, AND MILBRULONG DISTRICTS.

J. N. WHITTET, H.D.A., Agrostologist.

OWING to the considerable amount of interest being displayed by farmers and pastoralists in top-dressing as a phase of pasture improvement work, the first year's results of comparative trials at several centres are given in the following pages.

In every case the areas have been handled in a similar manner to the stocking methods ordinarily adopted on the holding, in order that the results obtained may be comparable with what would be expected in other parts of the locality and in districts where corresponding soil and rainfall conditions obtain.

Milvale.

(Average annual rainfall at Stockinbingal for seven years, 18.42 inches.)

On Mr. W. P. Heffernan's property, Glen Oak, very successful results were obtained from a Departmental grazing trial, where an application of 84 lb of high-grade superphosphate was made during the first week in May, 1926. A paddock of 240 acres was divided into two sections of 140 and 100 acres respectively, the principal pasture plants present being Barley grass (*Hordeum murinum*), Annual Canary grass (*Phalaris minor*), Ball, Woolly, and Hop clovers (*Trifolium glomeratum, T. tomentosum*, and *T. procumbens*), and Burr clover (*Medicago denticulata*).

The main plants to respond in the superphosphate-treated paddock of 140 acres were the clovers (especially Ball and Burr clover) and Annual Canary grass. In the unmanured area there was an absence of the profuse clover growth seen on the treated area, and Saffron thistle (*Carthamus lanatus*) was particularly thick. One of the most promising features of this trial was the manner in which the top dressed plants were tending to crowd out undesirable weeds, such as Black and Saffron thistles.

Observations made on 27th October, 1926, were to the effect that in the top-dressed paddock, the runners of Ball, Burr, and Hop clovers were 12 to 16 inches long, whereas those in the unmanured paddock were only 3 to 4 inches, and not very robust. With the advent of warm conditions, the unmanured plants were becoming very spindly and drying up, whereas the top-dressed were vigorous and green and still providing succulent feed.

It was estimated, even as early in the trial as this date, that the unmanured paddock, with average rainfall conditions, would only carry at the rate of one to one and a quarter sheep per acre for the remainder of the

twelve months' period, viz., to 30th April, 1927, while it was very apparent that the top-dressed section would easily carry 100 per cent. more, and perhaps an even greater number of sheep. These estimates were later on proved to be correct, as will be seen on examination of the accompanying table.

Fig. 1.—Unmanured Pasture; W. P. Heffernan's, Milvale, October, 1926.

Fig. 2.—Pasture treated with 84 lb. Superphosphate per acre; W. P. Heffernan's, Milvale, October, 1926.

Owing to the wet conditions experienced in August and September, it was found necessary to remove the sheep from both areas to higher ground. This country is a fairly heavy clay loam, and the area has been out of cultivation for seven years prior to commencing this trial.

Particulars of the stocking of the paddocks for the twelve months were as follows:—

Month.	Sheep carried on 100 acres, unmanured.	Sheep carried on 140 acres, top-dressed.	Month.	Sheep carried on 100 acres, unmanured.	Sheep carried on 140 acres, top-dressed.
May, 1926	113	158	November ...	250	700
June	113	158	December... ...	150	700
July	128	280	January, 1927 ...	150	560
August	128	280	February	125	425
September	Nil.	Nil.	March	125	425
October	250	700	April	125	425

The rainfall registrations at Glen Oak for period of the trial were:—

May, 1926	175 points.	December	153 points.
June	145 „	January, 1927	244 „
July	86 „	February	25 „
August	177 „	March	— „
September	101 „	April	65 „
October	87 „		
November	— „	Total	12·58 inches.

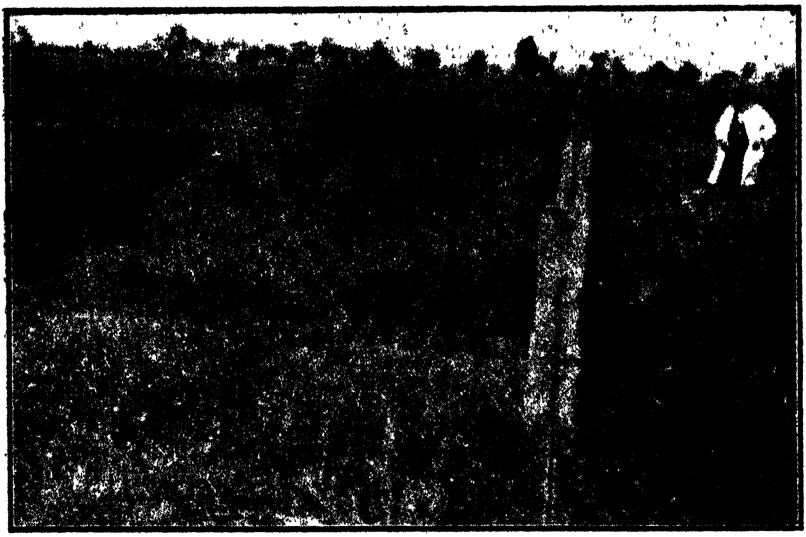


Fig. 3.—On the left, no manure. On the right, 84 lb Superphosphate per acre; W. P. Heffernan's, Milvale, October, 1926.
Note the difference in growth.

Parkes.

(Average annual rainfall for thirty-three years, 20.72 inches.)

On Mr. H. K. Nock's property, Nelungaloo, a Departmental grazing trial was commenced on 15th June, 1926, on an area that had been out of cultivation for four years. A paddock of 240 acres was subdivided, paddock "A" of 120 acres receiving 56 lb. of ordinary superphosphate per acre during the first week in June, and paddock "B" being unmanured.

The pastures consist mainly of Barley grass (*Hordeum murinum*), Rat Tail Fescue (*Festuca bromoides*), Crowfoot (*Erodium cygnorum* and *E. cicutarium*), Burr clover (*Medicago denticulata*), and Ball and Woolly clovers (*Trifolium glomeratum* and *T. tomentosum*). Black oats (*Avena fatua*) were also present.

In November, 1926, paddock "A" was carrying three times as much feed as "B," as will be seen in Fig. 7.

The stocking of the paddocks for the twelve months' period 15th June, 1926—14th June, 1927, was as follows:—

Grazing Period.	Sheep carried on 120 acres, top-dressed.	Sheep carried on 120 acres, unmanured.
1926—June-September, 61 days ...	700 ewes and 500 lambs	....
" 46 " ...	....	700 ewes and 500 lambs.
" 20 " ...	....	707 wethers.
October and November, 38 days	707 wethers	....
" 32 "	....	80 rams.
1927—December and January, 28 "	400 ewes	....
" 30 "	100 "	....
February, 22 days	50 "	....
March, 19 days	250 "	....
" 12 "	....	1,500 ewes.
" 15 "	650 ewes and 400 lambs	....
" 15 "	....	1,100 ewes.
April and May, 42 days ...	850 ewes and 600 lambs	....
April, 9 days	....	900 ewes.
May, 7 "	....	500 "
" 5 "	....	230 "
" 4 "	250 ewes	....
May and June, 38 days ...	750 "	....

At the completion of the twelve months' trial, Mr. Nock estimated that there was sufficient feed on paddock "A" for 750 sheep for four weeks, and on paddock "B" for 500 sheep for three weeks. For the twelve months' period the top-dressed area carried at the rate of nearly four sheep per acre, and the unmanured slightly less than five sheep to 2 acres. *These figures do not include the number of lambs of varying ages which were on the areas.*

The rainfall at Nelungaloo for period of the trial was:—

May, 1926	185 points.	December	248 points.
June	249 "	January, 1927	330 "
July	93 "	February	— "
August	58 "	March	120 "
September	172 "	April	59 "
October	27 "		
November	8 "	Total	15·49 inches.

At Nelungaloo it was found that the residual effect of an application of 34 lb. of ordinary superphosphate per acre made in the autumn of 1924 to

natural pasture was still slightly in evidence. Although there was not a very marked increase in growth of the plants compared with adjoining unmanured areas, the growth of clover on the top-dressed section was more forward, and clearly indicated where the drill had been run in distributing the fertiliser.

Milbrulong.

(Average annual rainfall at Lockhart for twenty-seven years, 18.17 inches.)

At Messrs. Gollasch Bros.' property, Pine Park, the departmental grazing trial was begun on 31st May, 1926, an application of 84 lb. high grade superphosphate per acre being made. Each paddock is 80 acres in extent,

Fig. 4.—Pasturage cut from 1 square yard each of Top-dressed and Unmanured Pasture.

Weight cut from top-dressed area (left) was 9 lb. 2 oz.; from unmanured (right) 1 lb. 14 oz. Latter was practically all Saffron thistle and barley grass with a little Ball clover (*Trifolium glomeratum*). The cut from the top-dressed area was mainly succulent Ball clover, which had crowded out weeds and inferior grasses. The experiment was conducted on Mr. W. P. Heffernan's property, "Glen Oak," Milvale, and the pasturage was cut on 15th October, 1926.

both being typical of the ordinary pastures of the district and neither having ever been cultivated. The pasturage consists mainly of native grasses, viz.:—Wallaby grasses (*Danthonia semiannularis* and *D. racemosa*) Spear grass (*Stipa scabra*). In addition other plants which are fairly plentiful are Barley grass (*Hordeum murinum*), Rat Tail fescue (*Festuca bromoides*) and Ball, Hop, and Burr clovers (*Trifolium glomeratum*, *T. procumbens* and *Medicago denticulata*).

When inspected in October, 1926, both paddocks were found to be in good condition, the top-dressed one carrying approximately four times more feed than the unmanured. In this trial the response made by Ball clover to the application of fertiliser was remarkable.

The stocking of the paddock was as follows:—

Period.	Sheep carried on 80 acres, unmanured.	Sheep carried on 80 acres, top-dressed.
1926—17th May to 31st May	160 ewes	160 ewes.
15th July to 31st August	98 ewes and lambs...	167 ewes and lambs.
1st September to 31st October ...	120 ,, ...	240 ,,
1st November to 31st December ...	120 ,, ...	420 ewes.
1927—1st January to 16th May	120 ,, ..	400 ,,

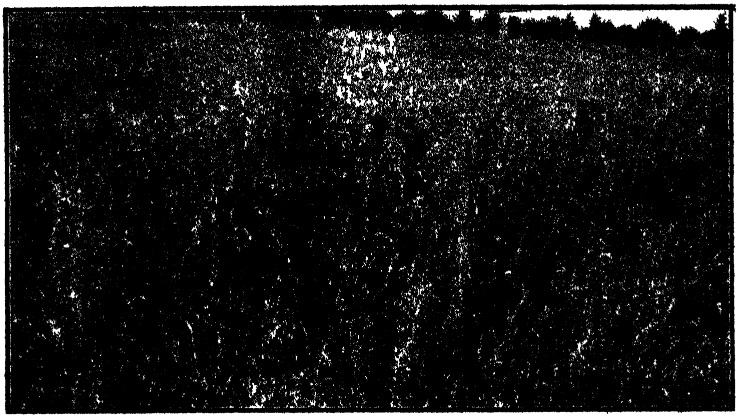


Fig. 5.—Saffron Thistle and other weeds were plentiful in the unmanured paddock; W. P. Heffernan's, Milvale, October, 1926.
Compare with Fig. 6.

Fig. 6.—Profuse growth of Grass and Clover, due to top-dressing, has tended to crowd out weeds.
W. P. Heffernan's, Milvale, October, 1926.

It is interesting to note that the paddock to which the fertiliser was applied carried five sheep per acre during the driest part of the period, viz., November to May. The sheep on the top-dressed area were found by the owners of this property to thrive right through the summer on the residue of the winter growth of clover plants and clover burr pods and seed, whereas on the unmanured section the sheep lost condition on the dry grass.

The rainfall at Milbrulong for the period of the trial was:—

May (17th to 31st), 1926..	53 points.	January, 1927	90 points.
June	250 ,,	February	70 ,,
July	153 ,,	March	— ,,
August	322 ,,	April	— ,,
September	213 ,,	May (1st to 16th) ...	117 ,,
October	168 ,,		
November	15 ,,	Total	15·22 inches.
December	71 ,,		

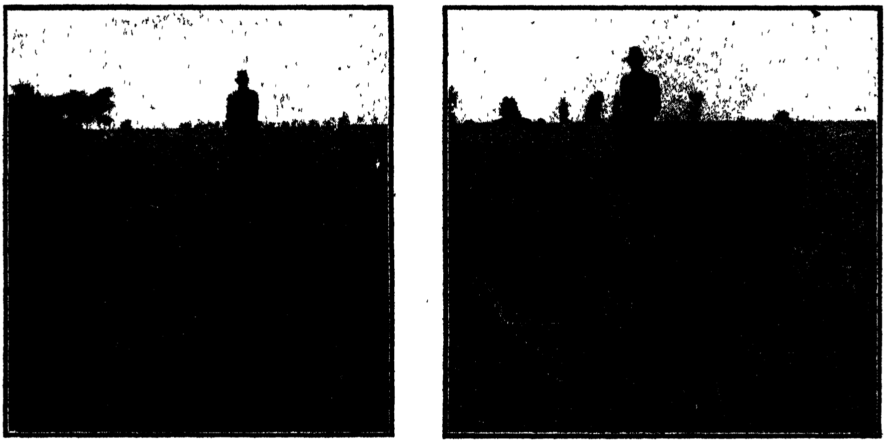


Fig. 7.—Value of Superphosphate to the Grazier.

Mr. H. K. Nock's property, Nelungaloo, Parkes district, photographed on 17th November, 1926. On the left is a paddock of 140 acres unmanured, and on the right a paddock of the same area which received a top-dressing of 56 lb. ordinary superphosphate per acre in June, 1926.

The heaps shown in Fig. 10, each represent the amount of produce cut from 1 square yard of pasture. The plots were located in an ordinary pasture paddock that had never been cultivated. The fertiliser was applied in May, 1926, and the green weights obtained in October of that year. About 90 per cent. of the pasturage on the plots consisted of Ball clover.

General Remarks.

At the conclusion of the twelve months' period at Milvale, it was very apparent that the top-dressed pasture had an advantage over the unmanured area, as the former finished up the twelve months with about seven times more clover and other useful seed to thicken up the next season's growth, and also provide feed in the form of clover burr. It was also evident, apart from the increased carrying capacity of the top-dressed

Fig. 8.—Unmanured Paddock at Gollasch Bros., Milbrulong, October, 1926.

Fig. 9.—Pasture treated with 84 lb. Superphosphate; Gollasch Bros., Milbrulong, October, 1926.

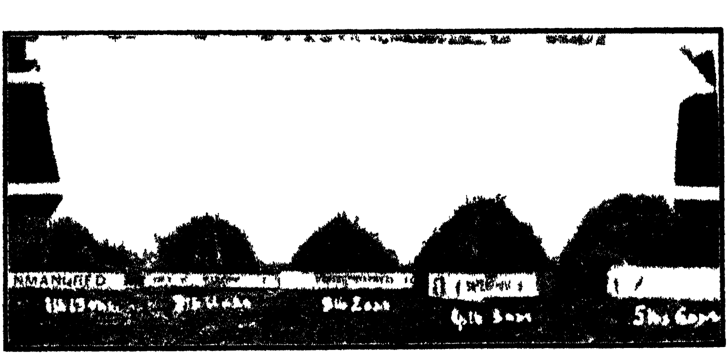


Fig. 10.—Weights of Green Materi l obtained from 1 square yard of pasture; Gollasch Bros., Milbrulong, October, 1926.

Unmanured.	28 lb superphosphate	56 lb superphosphate	84 lb. superphosphate	112 lb superphosphate
1 lb. 13 oz.	2 lb 11 oz.	3 lb 2 oz	4 lb 3 oz.	5 lb 6 oz.

paddock, that there was an almost total absence of Saffron thistle, whereas in the adjoining unmanured portion this weed seemed to predominate, and was reducing the growth and spread of clovers and valuable grasses to a considerable extent.

The cost for fertiliser and applying same at Milvale worked out at 5s. 9d. per acre. This expenditure will be spread over two years, as that is the total length of period of the present trial.

During an average season at Nelungaloo, top-dressed Burr clover produces nearly as good results as top-dressed Subterranean clover. In a dry season and under equal conditions of stocking, Burr clover would prove superior as it is hardier, and more feed in the form of seed pods would be available for sheep when the clover had dried off.

By the use of superphosphate we are able to prolong the growing period of the clover and other herbage plants well into the summer. In most cases that is the time of year when green feed is scarce, and especially so in herbage country. As a result of the increased growth and consequent seed production of useful grasses and Ball and Burr clovers, due to the application of fertiliser, top-dressed paddocks would have a distinct advantage over unmanured areas owing to the thickening up of the useful plants in the pastures.

These trials are to extend over a period of two years with only the one application of superphosphate. This course is being adopted, in order to test the residual effect of the 1926 application of the fertiliser.

Handling Fat Lambs in Transit.

The losses that result from bad handling of fat stock in transit are drawn attention to by the New Zealand Meat Producers' Board in their annual report for the year 1926-27, as follows:—

"It may not be generally known that a great many lambs graded second class are put into this grade on account of bruising; and from investigations made by officials of the Board it has been found that a good deal of this bruising has been caused by pulling the lambs by the wool, particularly in trucking. The loss that takes place from this cause should be a matter of concern to every farmer. As an illustration of the damage that takes place in this direction it may be noted that in a report received from one of the Board's graders he mentions that in a lot of lambs inspected at a freezing works, he counted 101 second class, forty-three of which would have gone into the prime grades but for bruising, whilst a number of the second-quality lambs were also bruised, and out of ten rejections, seven were on account of bruising."

In this connection Mr. E. A. Elliott, Sheep and Wool Expert, remarks that a good deal of bruising is traceable to carelessness during marking. If the lambs are caught roughly by the hind leg it is quite probable that one of the joints will be wrenched and that a bruise, and perhaps a swollen joint, will result, which will not have time to become normal (if it ever does) when the lamb is fit for market. The proper way to catch a lamb is round the body behind the shoulders.

"Sheep Production."

Impelled by a period of great activity in the sheep industry in the United States, Mr. L. J. Horlacher, Associate Professor of Animal Husbandry at the University of Kentucky, has compiled a work of 400 pages, which, while not proposing to be exhaustive, deals with "the more important fundamentals underlying profitable production." The book has grown out of the author's classwork in the University, but extensive use is also made of the publications of the United States Department of Agriculture and of the various experiment stations. As reflecting what may be regarded as the soundest of American practice the work is therefore of considerable interest in this country.

Consistent with the outlook and objectives of sheep-raising in the United States, and with the fact that 90 per cent. of the sheep sold in the open market are lambs, the book discusses chiefly the mutton and lamb side of the business, and these chapters are certainly most interesting. The spring and summer management of the flocks is dealt with thoroughly, as are preparation for market and marketing. The matter on fattening of lambs and feeding of concentrates and of roughage will be distinctly valuable under American conditions, while encouraging the feeling that we have something to learn here. Certain recommendations in flock management, such as the use of one ram to twenty-five ewes, and detailing with a heated chisel on the ground that the wound heals more rapidly, would not, however, be assented to in Australia.

When it comes to the subject of wool the book is only elementary, and the treatment of the clip described, is generally far behind the methods practiced in Australia. The book discusses the different types of wool produced in America, and a marked improvement in recent years is credited to American breeders. What is said about various breeds and their wools discloses an estimation of crossbred wools that simply would not be understood—far less accepted here. The long-wool crosses, which have been such a feature of the developments in wool production in the last twenty years in Australia, are apparently barely appreciated in North America, but, on the other hand, the Down breeds—so valuable in relation to the production of mutton and lamb—are also valued "over there" for the wool they produce when mated with the Merino. In fact, the wool produced by Down and Merino crossbreds is placed next in value to pure Merino. It is recorded that at one exhibition Dorset Horn x Merino fleeces were actually judged as among the most ideal for quality, quantity, and character! What would happen to a buyer—to say nothing of a grazier or sheep-farmer—who took that view in Australia?

It will be seen the book makes interesting reading, and it has a valuable place among sheep and wool literature.

Published by the McGraw-Hill Book Coy., Inc., New York, from whom comes our copy.

While one of the essentials of feeding is to feed enough, it must be remembered that quality is not the only consideration. There are foods that fill and foods that feed, and there is often a tendency to think that if cows are given "a bellyful" nothing remains to be done. Profitable production comes neither from cows that are half-starved, nor from those that are over-fed, but from those that receive a sufficient quantity of the right kind of food, that is a balanced ration.—E. K. Hall, in *Farming in South Africa.*

Farmers' Experiment Plots.

POTATO TRIALS, 1926–27.

Northern District.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

EXPERIMENTS with potatoes were conducted by the following farmers in co-operation with the Department:—

J. W. Jay and Sons, Ben Lomond.
H. Brookfield, Red Range.
F. Wild, Dangarsleigh.
J. Hill, Guyra.
W. Reddacliff, Tenterfield.
W. H. Bluford, Aberdeen.
F. Garland, Singleton.

The enthusiasm and ability devoted to the efficient conduct of the plots by these experimenters is being rewarded by the ready acceptance of the results by the farming community.

For a number of years, variety and fertiliser trials have been conducted in the New England district—an elevated tract of country ranging from 2,500 to 4,500 feet above sea-level, stretching for about 150 miles from Woolbrook to the Queensland border and 30 miles wide, and possessing mostly basaltic or granitic soil, a cool climate, and a generally satisfactory rainfall. In this district the growing of potatoes, oats, and maize is the main livelihood of many farmers. This season an extension was made to include the warmer localities of Aberdeen and Singleton in the Upper Hunter Valley—two important agricultural centres where at present potato growing is a side-line only with a few farmers, but where it is claimed that good yields can be obtained.

The following table shows the rainfall during the fallow and growing periods at the various centres:—

Rainfall.

Place.	Fallow Period.	Growing Period.
	points.	points.
Ben Lomond	183	1,500
Red Range	2,383	2,159
Tenterfield	988	2,080
Guyra	618	1,418
Armidale	634	1,009
Aberdeen	60	230
Singleton	1,304	1,565

Features of the precipitation were a shortage in October and November, and an excess in December and January at the New England centres, while at Singleton no rain fell in February, followed by an excess in April. At Aberdeen the crop was irrigated.

The Plots.

Ben Lomond.—The previous crop was an unfertilised oat crop in 1925, which was cut for hay. The land was ploughed 25th August, 1926, and harrowed shortly after; variety trial section again ploughed 1st October. Sown 1st to 3rd October in drills 30 inches and sets 21 inches apart. Crop harrowed three times to 8th November, inter-row cultivated on three occasions until hilled 24th November and 11th December. The soil is a red, friable, medium loam of poor water-holding capacity. The rainfall for October, three falls totalling 91 points, and for November, three falls yielding 96 points, was deficient, especially as only 183 points of rain was registered during the fallow period. This light rainfall in the early period of growth was detrimental to the short season varieties such as Satisfaction, Great Scott, and Factor. Rutherglen bug severely damaged the early-maturing varieties. Of the long-season varieties, Symington was least affected. Apart from a sprinkling of virus disease and eelworm infestation, good quality tubers were harvested.

Dangarsleigh.—In 1925 an unfertilised crop of wheat was grown on this plot; sheep were turned on the stubble and remained till the land was ploughed in June 5 inches deep; it was harrowed shortly after and ploughed 4½ inches in August; the sets, mostly whole seed, were planted on 13th November. The soil is a black, heavy, self-mulching basaltic loam. The weather conditions were dry till December; a large percentage of the sets dry-rotted and failed to make plants. The excess rainfall of December and January caused further loss by rotting and the trial was abandoned.

Red Range.—The previous crop was maize, unfertilised, in 1924. There was no crop in 1925, when an endeavour was made to rid the land of self-sown potatoes. Ploughed 6 inches deep in November, 1925, harrowed July, 1926, ploughed August 8 inches deep, and harrowed immediately after, again harrowed mid-September. Planted 27th and 28th September. No fertiliser was applied in the variety trial. Satisfaction variety was sown in the fertiliser trial. The plot was inter-row cultivated on occasions and lightly hilled. The tubers harvested were generally of good quality with only slight attack of wire worm and a little eelworm in one section of the field. The soil where the experiments were located is a red, medium, gritty loam of poor water-holding capacity, and of basaltic origin.

Tenterfield.—The land was under native pasture until ploughed in mid-April, 1926. The soil is a light, sandy, grey loam of granitic origin. First ploughed 3 to 4 inches deep to destroy couch in April; harrowed fourteen days later; ploughed 8 inches deep early in June; harrowed shortly after; ploughed early August 6 inches deep, and harrowed twice prior to planting on 15th September. Directly after planting the field was harrowed once and again on 28th September; scarified 28th to 31st October; cultivated after good rain in mid-December. No rain fell from planting to 16th December, and during this interval cutworms in great numbers partly destroyed the foliage and checked the underground runners from developing. A remarkable recovery followed the bounteous rains of late December,

which, owing to the porous nature of the soil, did not materially affect the crop. Good quality potatoes were harvested. The suitability of Symington variety and M3 fertiliser at the rate of 364 lb. per acre were again demonstrated.

Guyra.—Land had been cropped for several years, potatoes being previous crop. Sheep were in the paddock till ploughed 6 inches deep in June. Ploughed again 6 inches deep in September on account of weeds showing. Planted 18th October, harrowed directly after sowing, and again when plants about 6 inches high; inter-row cultivated twice and hilled when well in flower. The shortage of rain until December affected particularly the early-maturing varieties Great Scott, Early Manhattan, and Satisfaction. Rutherglen bug was especially severe on Great Scott and Satisfaction, but did little damage to Symington, Dakota Red, and Kerr's Pink. The Kerr's Pink were poorest quality, generally unshapely. The soil, a medium, heavy, gritty loam (basaltic), is more retentive of moisture than at Ben Lomond or Red Range, and was waterlogged to the detriment of the tubers, especially during January. To this fact and to the greater Rutherglen bug damage than elsewhere, are attributed the lower yield. A rotation with legumes may improve the condition and productivity. Although a fertiliser trial was conducted, the yields are not quoted, as they were not comparable owing to the waterlogging.

Singleton.—The land on which this plot was located had not been previously fertilised; the soil is a deep, medium, alluvial loam, fallowed in 1925; previous crop melons, marrows, and tomatoes in 1926. Cultivation consisted of five ploughings, each 1 foot deep, from July to January, and harrowing prior to and following the last ploughing. These deep ploughings were mainly to destroy weeds, and especially to bury couch, it being held locally that if deeply enough covered couch will die; the crop was free of couch. Sets planted on 1st February in furrows 6 inches deep, opened out about 30 inches apart. Very small Carmen, whole seed, which had been purchased by the farmer was planted in the fertiliser trial. The tubers were evidently from a spring-sown coastal crop recently dug and forced to sprout. A very poor stand resulted, and although the cultivation was good and the moisture content satisfactory, the yields were very poor. This in part was due to damage by Rutherglen bug and green hopper. Owing to the uneven stand, yields from the fertiliser plots were not tabulated.

Aberdeen.—Soil a deep, fertile, alluvial loam, very suitable as to texture and slope for furrow irrigation. This trial was mainly to ascertain a suitable time to apply water as well as the merits of varieties and fertiliser. The previous year pumpkins were grown on the area where the varieties were located, and potatoes, followed by sorghum, when the fertiliser trial was situated. The land has not been in cultivation many years, and no fertiliser had previously been applied. The land was ploughed 6 inches deep early in August, and harrowed a few days later. Only 60 points of rain fell from ploughing to planting. Drills 30 inches apart were ploughed out to a depth of 5 inches five days prior to planting, and water run along

the furrows, which were kept full for one and a half hours, it being estimated that this was equivalent to 5 inches of water over the whole area. Prior to irrigating moisture was showing well in the subsoil. The sets were placed about 18 inches apart and covered by cultivation. No fertiliser was applied in the variety trial, and in the fertiliser trial it was spread by hand along the opened drills. Approximately 8½ cwt. of seed was sown in the fertiliser trial, and about 11 cwt. in the variety trial. The varieties were planted on 30th and 31st August, and the fertiliser trial on 17th September. A 5-inch irrigation in furrows was given the fertilised section on 14th and 15th September.

On 18th September the plants in the variety section were showing above ground; this section was harrowed on 20th September. On 1st November the plot was slightly hilled with the single-row cultivator, leaving a shallow depression between the rows; this was followed by a 5-inch irrigation by running the water down the depression between the rows. An examination on the 5th November disclosed tubers 1 to 1½ inches in diameter, and it was considered that the watering could have been done to greater advantage about 24th October with the object of encouraging a greater number of underground stems. A shallow inter-row cultivation was done three days after watering. There was a general failure to produce flowers, there being a few dwarfed buds only, and in some places no inflorescence. On 5th November a few Rutherglen bugs and leaf-hoppers were noticed. The growth at this time was vigorous and ample, and the prospect bright for a heavy yield in the variety trial. From planting until 1st November approximately 10 points of rain fell.

YIELDS in Fertiliser Trials.

Fertiliser.	Ben Lomond.		Red Range.		Tenterfield.		Aberdeen.	
	ton.	cwt.	ton.	cwt.	ton.	cwt.	ton.	cwt.
*P3, 4 cwt. per acre	9	17	8	17	8	17	...	
*M13, 364 lb. per acre	8	0	5	19	8	12	3	6
*M3, 364 lb. per acre	8	17	5	0	10	12	5	0
*Special No. 1, 380 lb. per acre	8	12	7	17	10	9	...	
Blood and bone, 3 cwt. per acre	8	14	7	12	10	0	...	
Superphosphate, 280 lb. per acre ...	7	12	4	12	7	8	3	6
*M11, 420 lb. per acre	7	19	...		...		...	
Unfertilised	7	10	5	7	7	2	...	

* The composition of the mixed fertilisers is as follows:—P3, 10 parts superphosphate, 3 parts each sulphate of potash and sulphate of ammonia; M13, 10 parts superphosphate, 3 parts sulphate of potash; M3, 10 parts superphosphate and 3 parts sulphate of ammonia; M11, 2 parts superphosphate, 1 part nitrate of soda; Special No. 1, 14 parts superphosphate, 5 parts sulphate of ammonia.

In the fertiliser trial at this date there were several misses; the plants were dwarfed, and in some instance a few buds had developed.

On 6th November a sharp frost cut many tops to the ground, and generally damaged 4 inches of stem growth; it was so severe that an adjoining 5-acre crop of maize was killed.

From 6th November Rutherglen bugs appeared in swarms. From 16th to 18th November a 5-inch irrigation was given, and four days later the cultivator was run through the rows. From planting to 6th December 130 points of rain were registered, and the crop benefited by a further 100 points by the end of the month.

The varieties were fully mature about the end of December, but the continuous and heavy drain on the sap by the Rutherglen bug militated against high yields. The varieties Satisfaction and Great Scott were most damaged; Symington and Queen of the Valley (the latter occurring as a slight admixture with Satisfaction in the fertiliser trial) were least affected by the bug. No fungous disease was noticeable, and good quality tubers were harvested from the variety trial.

The following suggestions are made in connection with future trials in this district when the rainfall is deficient. A 5-inch irrigation should be given along the rows four days prior to planting, which should be carried out during the first week in September, and the sets covered by the cultivator working between the rows directly after planting. A second watering of 5 inches should be given just prior to the budding stage of maturity, followed by an inter-row cultivation, a third watering of 5 inches fourteen days after the second, and a final hilling. At the first appearance of Rutherglen bug and leaf-hopper, a contact spray should be applied, and repeated applications given from time to time to keep the pest in check.

Comment.

The cool climate and good rainfall of New England are apparently favourable to the beneficial effect of fertilisers. Experiment plot results over several years show good yields from the addition of sulphate of ammonia to superphosphate in the proportion of about three to four parts to ten, when about 3½ cwt. per acre of the mixture is applied with the potatoes. Where the potato crop has been grown following a fertilised legume crop, or after a year without cropping, but with the land stocked. there is recent evidence that superphosphate without the addition of sulphate of ammonia produces satisfactory returns. At Red Range a complete fertiliser consisting of ten parts of superphosphate (17 per cent. soluble) and three parts each of sulphate of ammonia and sulphate of potash applied with the sets at the rate of 4 cwt. per acre generally has given highest yields. Red Range soil is more gritty, deeper, and drains more freely than that of the other localities. Usually the addition of sulphate of potash to superphosphate does not produce more profitable yields than superphosphate alone; this season, however, it did so in places.

Several of the varieties have now been tested over a number of years, and for New England conditions Factor leads in yield. Until recently, yellow or white skinned potatoes were not in favour, but although Factor is of this class, it has been recognised as a good cooker and of good flavour. Symington has also been a consistently good yielder, and if it continues to show such marked immunity to attack by the Rutherglen bug as it did at

each place at which it was tested this year in the north it will become the most popular variety. It is especially valuable on the poorer soils, and needs close planting on the general run of fertile soils in which potatoes are grown in New England to obviate a tendency to produce big potatoes. Mr. C. Symington claims to have produced this variety while share-farming with Mr. H. White at "Bald Blair," Guyra, by grafting two potatoes of different varieties. Supervised efforts to reproduce the graft have failed, and it is doubtful whether he succeeded originally or whether the product he obtained was a "sport," a fairly common occurrence with potatoes. To his credit, however, is the saving of this potato, and the selection to type which he efficiently carried out for several years, and the honor of having the variety named after him is well deserved.

YIELDS and Percentages of Seed Tubers in Varieties.

Variety.	Ben Lomond.			Red Range.			Tenterfield			Guyra.		Aberdeen		
	Yield.		Percentage of seed tubers.	Yield		Percentage of seed tubers.	Yield.		Percentage of seed tubers.	Yield.		Yield.		Percentage of seed tubers.
	ton.	cwt.		ton.	cwt.		ton.	cwt.		ton.	cwt.	ton.	cwt.	
Factor	8	1	24	...		...	...		...	5	5	6	4	16
Batlow Redsnooth ..	5	6	22	3	14	36	5	6	33	...		3	11	29
Great Scott	5	9	26	3	12	42	6	19	31	...		3	14	45
Symington	9	18	13	...		...	7	0	32	4	17	7	15	36
Coronation	7	0	23	...		...	...		...	...		...		...
Dakota Red	4	17	19	...		...	5	13	35	4	2	...		...
Teasdale	9	12	15	...		...	...		...	...		...		...
Scott's Satisfaction ...	2	11	35	3	10	31	...		...	...		...		...
Parson's Satisfaction	6	5	21	...		...	...		...	...		...		...
Early Manhattan ...	...		...	4	2	26	...		...	3	16	...		...
Up-to-Date	...		...	6	0	10	...		...	...		...		...
Brownell's	...		...	5	13	29	...		...	...		...		...
Kerr's Pink	...		...	...		...	4	10	...	3	7	...		...
Epicure	...		...	...		...	7	2	...	...		...		...
Satisfaction	...		...	...		...	...		...	...		4	8	...
Carman	...		...	...		...	...		...	4	16	...		...

Satisfaction variety has its stronghold about Armidale, where Messrs. Parsons, Price, and others have for years, by selection, maintained it in purity and productivity. It slumped in yield this season, mainly due to dry conditions in the early part of the season, and the partiality shown it by Rutherglen bug—possibly due to its advanced maturity compared to some other varieties at the time the bug was most active. Its great merit is as an early maturer, and it is a good flavoured potato that does not boil away or break up after prolonged cooking. These cause it to be extensively grown.

There is a distinct need of a medium early-maturing, high-yielding, red-skinned variety. Queen of the Valley is of this class, and is a very good cooker with white flesh, but it is too unshapely and has too many deep eyes.

A variety known as Grover, and another that has taken the old favoured name of Brownell have been tried recently and have shown merit; they will be further tested.

Coronation, at one time a favourite, is now a good deal neglected, though it has no superior in flavour or whiteness of flesh. The loss of popularity has been chiefly due to an increasing number of small tubers, a tendency to second growth, and the reddish-purple skin.

Kerr's Pink was introduced from Britain about five years ago; it is very prolific there, but has not yielded as well as others since introduced.

Although virus diseases were not strikingly present there is every indication that the spindly tops, uneven maturity, lack of vegetative vigour, dwarfing, and the large percentage of small tubers are due in part to the effect of this class of disease. Increasing precautions have been taken during recent years in selecting healthy plants for seed at some of the experiment plots, and farmers have been advised to do likewise. Greater attention is necessary, and, when given, the potato-growing industry will be placed on a more profitable plane. There was only a trace of early and late blight, Corky or Rhizoctonia scab. Of potato moth there was only a mild infestation in crops generally, and only occasional tubers were affected in the experiments.

Now the Drought is Over.

When the weary days of drought are over, and rain once more renews the veldt, and the soil hastens to show its fruitfulness in the revival of its crops, will the farmer, in the relief of the yearned-for rain, forget the lesson of the stricken crop and dead beast? . . . . Will he continue with the gamble of the past and once again rely entirely upon a rainfall that must fall at a due season and in a required volume if his crops are to grow and his cattle multiply?"—Questions recently asked farmers by the South African Department through the pages of their journal, and passed on to those farmers in New South Wales who have not yet given serious consideration to similar problems.

The Essentials of Co-operative Management.

The members of a new co-operation often expect too much. Seldom can a large organisation be formed without raising hopes too high. This is generally followed by disappointment, which only patient and capable management can overcome. The management must not only be efficient, but it must keep its membership; here lies one of the most important functions of the manager of a co-operative association. He must have such a vision of what a strong organisation can do that his enthusiasm becomes contagious. At the same time he must not buoy up his members with false hopes or extravagant expectations, for such are followed by discontent.—H. G. Wheeldon, in the *Rhodesia Agricultural Journal*.

LIVE AND DEAD WEIGHT OF PIGS.

AT a conference of delegates of German slaughter-houses and representatives of the German Agricultural Commission, as well as representatives of meat and cattle dealers in session in Berlin, in November, 1895, it was decided with regard to hogs that before the calculation of the dressed weight the following parts be excluded:—The organs of the thoracic, abdominal, and pelvic cavities, together with the tongue, trachea, and esophagus, with the exception, however, of the kidneys and peritoneal fat. The calculation of the weight should be as a whole or in halves. If the determination of the dressed weight is made within three hours after slaughter, 1 lb. is to be subtracted from every 100 lb. of so-called "warm weight."

According to various authorities, the percentage of dressed weight varies from 76 to 83, according to the quality of the hog. Lawes and Gilbert found that on an average the dressed weight of fat hogs was 82.6 per cent. of the live weight, whereas Hengot calculated the average dressed weight, from statistics during a period of three years, at 86.5 per cent.

In the meat markets of Berlin it is customary to deduct 20 per cent. of the live weight where hogs are sold according to dressed weight.

The following table from Henry and Morrison gives the average percentage of dressed carcase that pigs will yield on slaughter after being deprived of food for twelve hours :—

Live weight,	100 lb.;	dressed carcase,	72 per cent. or 72 lb.
,,	150 lb.;	,,	73 per cent. or 110 lb.
,,	200 lb.;	,,	75 per cent. or 150 lb.
,,	250 lb.;	,,	77 per cent. or 193 lb.
,,	300 lb.;	,,	79 per cent. or 237 lb.
,,	350 lb.;	,,	80 to 87 per cent. or 280 to 305 lb.

The small, immature pig yields the least, and the large, mature fat pig the greatest percentage of dressed carcase. For each 100 lb. live weight increase over the first 100 lb. the yield is approximately 4 per cent. more dressed carcase. The pig leads all the four-footed animals in the percentage of available carcase it yields.—C. C. BLUMER, B.V.Sc.

"THE PIG BREEDERS' ANNUAL, 1927–28."

THIS annual is regularly welcome to pig-breeders, on account of the variety and high standard of the articles it contains, as well as of the tables and other features which appear each year. The foreword for this volume has been written by Sir Daniel Hall, who points out that—unlike other farm animals—it should be possible to prepare a specification (or standard) for a pig that, irrespective of breed, would fill all the practical requirements of the farmer catering either for the porker or the bacon market. Such a specification would have the baconer chiefly in view, but the way would seem open to bring all our breeds of pigs up to a common standard as far as the business of meat production, which is the practical end of pig-raising, is concerned.

"Some Parasitic Diseases of Pigs," by Professor Basil Buxton, "The Need for Organisation in the Pig Industry" by Major Orme, "Some Experiences in Pig Feeding Experiments" by J. Golding and W. B. Morris, are but three out of the nineteen signed articles in the 150 pages that comprise this number.

Our copy from the National Pig-breeders' Association, London.

Farm Forestry.

II. Principles of Tree Planting.

[Concluded from page 841.]

R. H. ANDERSON, B.Sc.(Agr.), Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, Sydney University.

THE selection of a site will depend on the purpose of planting, and will be dealt with later under the respective headings. It should be noted, however, that although trees will often grow well on chemically poor soil, they will not thrive on shallow soil, and, with the exception of a few species, should not be planted on such areas.

Preparation of the Ground.

In general forestry work on a big scale it is impossible to prepare the ground for planting as thoroughly as could be desired. Very often the only preparation consists of digging a small hole, or merely inserting the plant in a wedge-shaped notch made by a spade or notching tool. The farmer, however, has only a small area and a limited number of trees to deal with, and the necessary labour is usually supplied by himself in any spare time. Further, he requires quick and certain results, and wishes to secure optimum conditions for his planting. General forestry work can allow for a number of failures, but in windbreak planting, for example, a single failure would spoil the efficiency and effect. Thorough preparation of the soil is therefore necessary.

Where a number of trees are being planted together, such as windbreaks, avenues, or tree lots, the land should be first ploughed. New land should be broken up before winter and allowed to lie until planting time. A plan which has its advantages is to make the first ploughing only deep enough to cover the grass and herbage. Shortly before planting the ground should be cross-ploughed deeply, and then harrowed. Ground previously under crops would probably contain many weed seeds, and to enable the young trees to become established before the weed growth becomes unduly aggressive such land should be ploughed and harrowed, and planted immediately afterwards with the trees. Where hillside planting is being carried out, the ploughing should follow the contour of the hills as far as possible.

Ordinary hole planting is attended with some risks, especially where the subsoil is impervious. In such cases the hole tends to become merely a pool of stagnant water and a grave for tree life. Where trees must be planted in holes, such as in the case of isolated shade, shelter, and ornamental trees, the holes should be made as large as possible. A hole 3 feet by 3 feet and 2 feet deep is the smallest size allowable, and larger holes, where possible, should be made. Where deep digging carries the hole into an impervious subsoil, it is better to make the hole wide and shallow, the depth not exceeding that of the soil. On wet, poorly-drained soil, ridges or mounds may be

formed as sites for planting. Ploughing two adjoining furrows so as to throw the sods together achieves this end in a minor way. Irrespective of what method is adopted, the preparation of the land should be completed before stock for planting is obtained.

Obtaining Stock.

Speaking generally, the landowner can obtain his young plants in one of three ways—

1. By growing plants from seed himself, and, where large areas are being planted, by forming a small nursery, in which all his stock is raised.
2. By obtaining stock from nurserymen or any other outside source.
3. By transplanting small seedlings from near-by bush or forest.

The last-mentioned method is not advocated in the majority of cases. Wild seedlings develop a straggling root system, and are difficult to transplant successfully unless obtained when very small. Even if such plants survive the shock of removal, they require extra attention, and often fail to develop into satisfactory trees. Nursery-raised stock provide the most healthy and suitable plants, and if correctly handled show little interruption to their growth and very few total losses.

Raising stock by the landowner himself has much to recommend it, particularly where it is intended to plant a fairly large number of trees. The operations involved are simple, and present few difficulties except in certain species. Details of the work will be furnished later on in this article, but the advantages of home raised stock might be briefly summarised. In the first place, such stock has become adapted to local conditions, and these remain unaltered when transplanting takes place. Most of the nurserymen dealing in trees are in the coastal areas, and stock raised under such conditions are not always adapted to other parts of the State. In the second place, stock may be planted at the most suitable or convenient time, whereas plants from outside sources have to be put out on arrival, or the trouble, and possible risk of loss, taken of heeling in until a more suitable time. In the case of home grown stock, advantage can at once be taken of suitable conditions that may be very temporary and fleeting. Thirdly, species may be grown which are not procurable from nurserymen. Some of our best shade and shelter trees are not stocked as plants, but seed may be obtained of them. Where suitable trees are to be found in the surrounding country, the landowner can secure good seed at no cost. Fourthly, the cost of home-grown stock is less. Costs of transport are eliminated, and risks of deterioration and faulty handling avoided.

The disadvantage of home-raised plants, however, is that the landowner has to wait one or two years before the stock is ready for putting out. By buying direct from the nurseryman he gains an initial advantage of a year or two, and this will naturally play a big part in influencing a decision. A further disadvantage is that, owing to the distraction of other work on the farm, young seedlings may be overlooked for a period, and not receive

the proper attention. Commercial nursery stock, on the other hand, has continuous and experienced supervision; unless, therefore, the farmer is prepared to give a certain amount of unbroken care and attention to his seedlings, he should not atttempt to undertake the work. Failure in this branch might prejudice his interest in other tree-planting work.

Generally speaking, then, when only a few trees are being planted, or where the farmer requires immediate results, stock should be obtained from nurserymen. Where large numbers are being planted, or where the species selected cannot be obtained from outside nurseries, the farmer should raise his own stock. When obtaining stock from nurserymen, care should be taken to obtain the best possible plants, and from a source which is known to be reliable both for healthy stock and for trueness to label. It should also be remembered that small plants are not only easier to handle, but generally make better and faster growth, and suffer less from transplanting than big stock. The bigger plants are harder to handle, suffer more from complete losses, and often receive a check from which they never completely recover. The tendency of the inexperienced planter is to imagine that planting big stock gives him an initial advantage, but the reverse is generally the case, and preference should be given to the small plants. It is only where special care and attention can be given that the big plant has its merits.

Planting.

When stock is obtained from a nursery the plants will arrive either in pots or open rooted. Potted plants will merely require to be placed in a sheltered spot and kept watered until needed for planting out, but open rooted ones should be immediately heeled in. If the roots are at all dry they should be first dipped into a mixture of clay and water, and then placed in a narrow trench in a slanting position, the earth being well pressed down about the roots and thoroughly watered. The soil should be kept moist until the stock is planted out. If exposed to sun the tops should be shaded in some way to prevent excessive loss of moisture. Provided they are properly heeled in, the plants may remain in the trenches for several weeks without injury, but the period should be kept as short as possible. When being removed to the planting site, the roots should be protected by immersing in water, or covering with wet sacking, as a few minutes' exposure to bright sunlight or to a drying wind will jeopardise their chance of survival.

A hole should be made large enough to accommodate the full spread of the roots comfortably, and with a raised mound in the bottom sloping down towards the sides. The roots should be spread over the mound in a natural position, so that no cramping or intertwining takes place, and with the ends of the roots all pointing in a downward direction. Fine soil should be filled in about the roots, firmly pressed down so that no air cavities are left, and thoroughly watered. After the water has soaked in, the remaining soil should be filled in, but kept loose and dry. In this way it acts as a mulch and retards evaporation. Plants should be placed slightly deeper than

they were in the nursery to allow for the loose soil settling, but the final depth should be the same as in the nursery. Plants from pots and ones with balls of earth attached should be planted without disturbing the roots unduly, but some advantage is to be gained by slightly loosening the soil round about the bottom of the roots. Pressing the soil heavily down about the roots, watering well, and mulching with loose, dry soil on the top are the main essentials for successful planting. In dry, hot localities a saucer-like depression should be formed at the surface round the plant to collect moisture.

Planting Period.

The best time for planting is when the plant is at its resting period, and when moist, cool conditions prevail. Generally speaking, May to August are the best months. The effects of frosts must be studied, and spring planting is often necessary in some localities, except for deciduous species. Where the rainfall is heavy and conditions generally cool, the planting period may be considerably extended. A cool, cloudy day and a fairly moist soil provide ideal conditions.

Tube Method of Planting.

Raising plants in tubes is practised extensively in India and also in South Australia. Tubes about 4 inches long are cut from the bamboo or common reed, filled with soil, sown with two or three seeds, and after the seedling has developed under nursery conditions, planted out, tube and all. The tube soon rots in the ground and allows the free development of the roots. Where summers are dry and where early plantings may be damaged by frost, the method of tube planting is especially advantageous. The soil in the tube retains sufficient moisture to tide the young plant over the first few days, so that planting can be delayed until the danger of spring frosts is over, without running the risk of allowing the ground to become too dry. Handling young stock is made more easy when the tube method is employed, and the soil round the roots is in no way disturbed. Jam tins may be used, but in some cases the young plants do not appear to thrive so well.

Sowing Seed *in situ.*

In the great majority of cases the landowner will plant the proposed area with young stock, and it is only under exceptional conditions that the sowing of the area with seed direct may be practised. Seedlings on a sown area are exposed to dangers right from the start, whereas in planting, the young stock have been protected during their most sensitive period. In general forestry work sowing seed *in situ* has sometimes many advantages, but the private landowner should rely on planting young stock except in one or two instances. Wattles, for example, may be sown either in lines or broadcast upon ploughed and harrowed land, and usually little trouble is experienced in getting good germination and growth. The native cypresses and some of the eucalypts may also be sown successfully *in situ* under favourable conditions.

At the Booborowie Experiment Farm in South Australia, where conditions are rather bleak and exposed, the broadcasting of eucalyptus seed has met with success in the case of some species, notably the sugar gum (*Eucalyptus cladocalyx*), grey box (*E. hemiphloia*) and *E. botryoides.* In three years after sowing the sugar gums reached a height of 14 feet.

Apart from broadcasting seed, the seed spot method may be adopted. In this method spots about 2 feet square are dug and raked to a fairly fine tilth. They are then sown with several seeds, and if a number germinate the most vigorous one only is allowed to remain.

Another method sometimes adopted is, instead of cultivating the entire area previous to sowing, strips several feet wide are ploughed at an even distance apart, and the seed is broadcast or sown in drills on these strips.

In the majority of cases, however, planting young stock is the best method of securing successful results.

Protection and Care of Planted Trees.

Any care exercised in planting trees is rendered ineffective unless they are protected from injury, and a degree of assistance is given to their proper development. The chief danger threatening young trees on the farm and pastoral area is damage by stock, and it is useless making plantings unless the whole of the area is effectively fenced off from animal invasion. Stock not only destroy or injure young plants, but by trampling and packing the soil nullify the effect of preparatory cultivation.

The fence should be stock-proof, and either permanent in character or sufficiently well constructed to keep out stock until the trees are beyond the reach of the largest animals. As the trees grow older, stock can be admitted from time to time with advantage, as they serve to destroy weed growth and lessen the danger of fire by removing surface litter. A permanent fence with a properly constructed gateway permits the regulation of such entry. Where it is only intended to protect the trees until sufficiently well grown to be proof against stock damage, a barbed wire fence is very effective. Where single shade or ornamental trees are planted out they should be protected by some form of tree guard. Protecting fences or tree guards should be provided for before the young stock is planted out.

Fire causes the loss of many trees, and although in forestry work on a big scale it is easily the most pronounced source of danger, in ordinary farm work its risks can be reduced to a minimum by a small amount of attention. On such areas local outbreaks are quickly detected, and generally easily checked. Where plantations are made on a larger scale, especially in the case of conifers, and where fire risk is fairly evident, breaks might be made round the boundaries of the plantation. For average farm work, however, no such provision is necessary.

It may be imagined that an ordinary ground fire running through an area of well developed trees would do little harm, but such fires are often hot enough to scorch and kill the living cambium layer just beneath the bark and outer wood, without the tree showing very evident injury. This results in cessation of growth in that portion, and commencement of decay, such

fires being often the cause of many trees being rotten at the base. Fire scars are also formed which deepen with every burn, eventually undermining the tree and paving the way for the entrance of timber destroying fungi and insects. The surface roots of trees are injured and valuable humus burnt out. Any young growth is destroyed.

The area under trees should be cultivated two or three times a year, especially for the first two or three years, in order to keep down weeds, prevent undue evaporation of moisture, and maintain good soil conditions. Weed growth in the early stages is particularly injurious, as it tends to suppress or completely destroy young tree growth, especially of the slower growing species. Weeds, moreover, increase the danger from fire, and reduce the available moisture supply. Under certain conditions, however, weed growth is of value in providing shelter for trees which are liable to injury by excessive heat, frost, &c., and on slopes and shifting sandy soil are of assistance in binding the soil. Generally speaking, however, the trees should be kept free from weeds as far as practicable. Where a cultivator can be used, operations are simplified, but where it is not possible to employ a machine, the trees should be periodically hoed around with a mattock or similar implement. Cultivation is particularly desirable in dry areas, in order to conserve soil moisture, and besides resulting in more rapid and better growth, frequently makes the difference between success and failure. The soil round the trees should always be loosened after rain so as to restore the surface mulch. Cultivation may usually be discontinued as soon as the canopy of leaves offer protection to the soil, or when surface roots interfere with operations.

In rabbit-infested country the trees may have to be protected by netting. Insects and fungi cause a certain amount of damage to trees, and the landowner, on noticing any evidence of such injury, should seek advice from Departmental officers.

Mistletoes are prevalent in many parts and do considerable damage unless checked. Young trees become deformed, and the vigour of older trees impaired. Mistletoe growth should be removed as soon as observed. As the roots of this parasite extend below the surface of the wood, and send out new shoots if only the external part is broken off, care should be taken to remove the cortical portion as well, and to suitably dress the wound. Where possible, the whole of the branch infested should be sawn off and burnt.

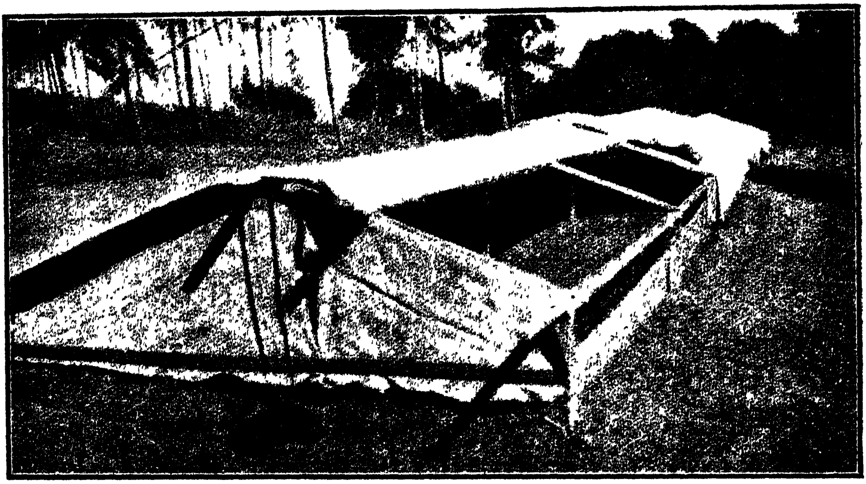
In many cases there will be a small amount of loss in the trees planted, and these should be replaced as early as possible. Most losses will occur in the first month or so, and replanting should be made immediately. If left until the next season, the "replants" will seldom catch up to the older trees, and are liable to suppression, except where spacing is wide.

Nursery Practice.

In most cases the farmer will purchase his stock from nurserymen, but the following notes may prove helpful to the man who intends raising his own plants

The methods adopted in raising young stock vary in detail according to the nature of the species and local conditions, but in general the procedure adopted is as follows:—

The Seed-bed.—Seed may be sown in boxes, in frames, or in the open ground. Where only a few trees are required, sowing in boxes is probably the best method to adopt, as these can receive better attention and are convenient to handle when in small quantities. Boxes about 18 inches square and 4 to 6 inches deep are filled with a light sandy loam which has been screened to remove all lumps and pebbles. The bottom of the box has



A Good Type of Frame for Farm Nursery Work.

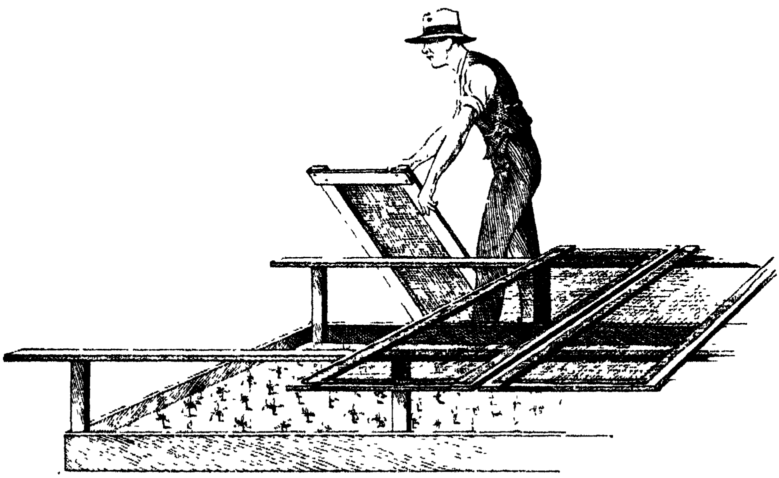
previously been bored with holes, and spread with broken stone or pebble to secure drainage. It is very often best to use a moderately coarse soil to cover the crocks, making the upper layers of soil increasingly fine. A mass of very finely sifted soil in a box is undesirable, as it has a tendency to sodden when watered and cake hard when drying out. The boxes should not be laid on the ground, but should be placed on small blocks of wood or bricks. They should be quite level, otherwise waterings or rain will wash the topdressing and seed to one end of the box.

Where sowings are made in the open ground, care must be taken in the choice of site, the main items to consider being protection against strong, hot, or cold winds, avoidance of frost hollows, good drainage, aspect, watering facilities, and soil. Closeness to trees should be avoided, as the roots of the latter rob the adjoining soil of moisture and plant food materials, besides causing undesirable shading and damage by drip during rainy seasons. The best soil is a light porous loam. Loose soils permit the development of a good rooting system, whereas stiff clays cramp the roots and have a tendency to cake. Sandy soils should be avoided in hot localities. A good and

convenient spot can often be found in the vegetable garden. The ground in any case should be dug deeply and thoroughly, and the soil worked to a fine tilth.

If necessary, frames may be made of boards and covered with hessian or similar material. Shading or exposure as required can be obtained by lifting the covering, or rolling it back, according to the method of construction. The bed is outlined with 6-inch boards and a framework built up as illustrated.

If available, tea-tree may be employed for making shade frames. A framework of wood is made, and two bands of hoop iron nailed across, the tea-tree being woven through in sufficient quantity to make the required density. It is further secured at either side by nailing a batten to the framework.



Seed-bed with Side-bearers carrying moveable Screens of Hessian or Tea-tree.

The employment of screens has several advantages; they give protection, make a subdued light for germination and early growth, and prevent undue evaporation after the initial watering. They are removed gradually, and the plants allowed to harden off until ordinary open conditions prevail. Where a number of boxes are being sown it is also of advantage to construct a frame in which they may be housed. Where seeds, particularly large ones, are stolen by birds or vermin, the framework can be covered with netting.

Sowing the Seed.—The seed should be sown on damp, but not wet, soil, and may be broadcasted or sown in lines, the latter method being usually the best for larger areas, as it facilitates handling, weeding, &c. If the seed to be sown is small, as in the case of eucalypts, the soil should be given a dressing of sand, well watered, and the seed sprinkled lightly on the surface and covered with fine dry sand. Where sand is not available, a light loam passed through a fine wire sieve will do, but heavy soils should be avoided.

The seed should be sown thinly, as a dense stand of seedlings will cause weak and drawn out plants, and make them more susceptible to destruction by "damping off." The amount of soil covering given to the seed varies with the size of the latter, a general rule being to cover with a thickness of soil equal to the thickness of the seed. After sowing, the soil should be kept from drying out, and if necessary watered daily through a fine rose. If boxes are used they may be covered at first with glass to prevent evaporation.

After the young seedlings have developed to about 2 inches in height they should be transplanted, and in many cases the taproot should be shortened back to approximately 2 inches. This cutting of the main root encourages the development of lateral roots, and the subsequent formation of a more vigorous and compact rooting system, in a form suitable for the final transplanting.

Transplanting from the seed-bed or boxes should not be unduly delayed; the small seedlings are "pricked out" in other boxes, in pots, or in lines in the open ground, a hole being made preferably with a round wooden tool, the seedlings inserted, and the soil pressed well down about the roots. The seedlings should be pricked out at distances of about 4 inches apart in the row, and the rows 6 to 12 inches apart. Subsequent treatment consists chiefly in keeping the ground well stirred and free from weeds, and, if necessary, watered. The time taken for the young plants to mature sufficiently for the final transplanting varies considerably with the species concerned, and with seasonal growth, but generally speaking they are ready for planting in four to eight months after being pricked out into the boxes or lines. With many species, such as eucalypts, which do not transplant easily, it is best to prick them out into pots or tins, so that the roots will not be disturbed when the plant is finally placed out. The average farmer will find that raising the seed in pans or boxes, and pricking out into pots, will provide him with good sturdy stock without a great deal of trouble. Where he requires large quantities, however, pricking out into the open ground or even sowing *in situ* will be found much less expensive.

In potting up seedlings, 3- or 4-inch pots are the most generally useful. A crock is placed over the drainage hole, a layer of broken stone or pottery added, and some moderately coarse potting soil run in. The pot is then filled to within about half an inch of the top with sifted soil. The plants should then be given some measure of protection, as, for example, provided by a frame. The pots may be "plunged" in an ordinary bed by rowing them out in trenches, and lightly covering them with soil. By this means they are kept cool and evaporation is reduced.

Treatment of Seed.—Some seeds require special treatment in order to ensure the best results. The seeds of wattles, for example, must be treated before sowing, in order to soften the hard seed-coat, which prevents ready germination but allows the seeds to maintain their vitality in the soil for long periods of time. Nature frequently accomplishes this task by the aid of bush fires, which char the seed-coat. Many a man has been surprised at the sudden appearance of wattle seedlings on his land after a fire has swept over it.

Various methods are adopted for hastening the germination of wattle seed, but the most convenient and the one most generally employed is to pour boiling water on to the seed and soak for twenty-four hours. Another method is to nick the seed coat with a file and soak before sowing.

Several other species of legumes are best treated in the same way, notably the Carob Bean, Robinia, and Honey Locust. Kurrajong seed is also sometimes treated by soaking in hot water to hasten germination. As opposed to the long continued vitality of the wattle seed, we find that some seeds retain their germinating power for very short periods only. In such cases little time should elapse between taking the seed from the tree and sowing. This applies to such species as the red cedar, teak, and kauri.

In the case of some of the larger seeds, such as hoop pine, walnuts, and acorns, it is often advantageous to sprout the seed before sowing by covering with wet bags or placing in wet sand. The sprouted seed is then placed out in pots or lines, or, if conditions are very favourable, in their permanent positions.

Raising Plants in Tubes.—Previous reference has been made to the tube method of planting, the details of the method being as follows:—Pieces about 4 or 5 inches in length are cut from bamboo or larger reeds, the nodes being removed so that the tube is open at both ends. A box large enough to hold all the tubes is taken, the bottom bored with drainage holes, a layer of broken stone or charcoal put in, and covered with 2 or 3 inches of soil. The tubes are packed together on top of the soil and their tops levelled off. They are then carefully filled with fine dry soil and watered thoroughly. Each tube is now sown with two or three seeds, and the whole covered with fine soil. The boxes can be conveniently moved into various situations for shelter and sunshine as required. When planting the tube in the permanent position, provision should be made for subsidence of the disturbed soil about it by placing it one half to an inch below the surface of the ground. Jam tins with the bottoms removed may be used in place of the tubes.

Raising Stock from Cuttings.—Many species set little or no viable seed, and must be propagated by cuttings, while other species are most conveniently reproduced by this method. The cuttings used for striking may be taken from young shoots, half-ripened wood, offsets from the base of old plants, or from roots, the source varying with the nature of the species concerned. Notable examples of trees reproduced by cuttings are the willows and poplars. The cuttings in these cases should be taken from well-matured one-year-old wood, short jointed, densely grained wood being preferred to long jointed softer wood. The length of the cutting should be roughly 8 to 10 inches. The basal cut should be made close beneath a bud or node, as it is mainly at these points that roots are formed. The top of the cutting should be cut at a longer distance above the bud, so as to secure the latter against being killed by the drying back of the wood. The cuttings should be planted in loose warm soil, such as sandy loam or even pure sand, and well watered. A damp atmosphere is desirable, as it prevents too rapid loss of water by transpiration during the period that the cuttings are without roots.

Collecting Seed.—Where the landowner proposes to raise his own plants, and where trees of the desired species are accessible, gathering seed is an inexpensive and fairly simple operation. Seed should be gathered from mature trees which are free from disease. Care should be exercised in obtaining only ripened seed, and a knowledge of the seeding period of the tree is essential.

Where the seed is borne in capsules, pods, or cones, these should be collected just prior to full maturity, as complete ripeness means the opening of the seed vessels on the tree and consequent loss of the seed. Seed of the eucalyptus can usually be gathered during summer and autumn, the capsules changing from green to brown on ripening. A convenient method is to cut off a number of seed-bearing branches and spread them on newspaper sheets until the capsules have fully ripened and shed their seeds. The latter can then be gathered up and sieved. Where small quantities only are required the ripe capsules may be placed in a dry box or tin and allowed to open. The seeds may then be loosened by shaking the box.

In the case of wattles and other pod-bearing trees, the pods should be collected when ripened but just prior to opening. If spread on sheets and exposed to sunlight the pods will ripen fully and shed the seed. The cones of pines should be collected before opening, generally in the spring months.

Succulent fruits, such as drupes and berries, fall off the trees when fully ripened, and may be collected from the ground beneath. The soft outer portion may be gently scraped off before sowing.

Breeding and Feeding Must go Hand in Hand.

Breeding and feeding go hand in hand. One cannot emphasise the one and disregard the other. If a cow lacks the inherited capacity to produce a large quantity of milk and butter-fat, no kind or amount of food or skill in feeding will make her a big producer. On the other hand, if she has the ability to milk well, then she must be properly fed. Many cows are so poorly fed that they do not have a chance to produce their maximum. Good feeding, care, and management are essential for the development of the potentialities with which cows are endowed through breeding.—E. K. Hall, in *Farming in South Africa.*

Artificial Foods for Pigs.

When some people wish to prove that modern ideas, particularly of feeding, are at fault, they say, "Oh, but pigs in their natural state did not get fish meal (or whatever the offending preparation in question may be), so I cannot see why they should need it now!" It is a hopeless fallacy to argue from nature to our modern farm animals: the pigs and cattle of to-day are not natural animals. They have been developed along utilitarian lines, and their appearance and constitution have been entirely changed. Moreover, they are a hundred times as thick on the ground to-day as they were in their natural state; consequently even outdoor pigs cannot have the same variety and choice of foods as their wild ancestors.—*Pig-breeders' Annual.*

Concrete Fence Posts.

N. L. JONES, Supervising Architect.

CONCRETE fence posts are easily and quickly made. Their initial cost is higher than for wood posts, but they have a decided advantage in that they are practically everlasting. Where long lines of fences have to be run, their weight is certainly a disadvantage.

A mould suitable for making posts for a sheep fence is shown in the accompanying illustrations. Five such moulds, each containing eight compartments, would be required to hold a yard of concrete, but moulds with any number of compartments may be used.

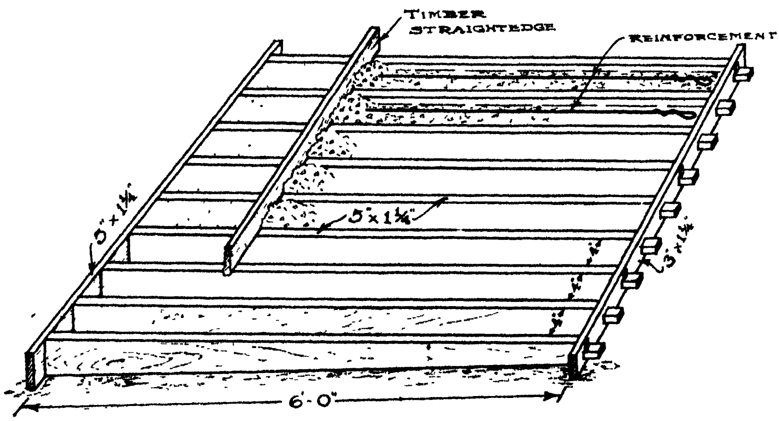
The posts cast in this mould will be 6 feet long, 5 x 4 inches at the base, and 4 x 3 inches at the top. It is essential that each be reinforced, and four No. 6 gauge wires may be used. Theoretically 1 cubic yard of concrete will make forty such posts, but in actual practice thirty-eight or thirty-nine are more likely to be made, according to the class of aggregate used.

To make these posts the concrete should be gauged one part cement, three parts sand, and five parts metal, broken to ¾-inch gauge. One cubic yard of concrete of this gauge will require three and a half sacks of cement, each containing 124 lb.; 14 cubic feet of sand (say, one load); 23 cubic feet of metal (approximately 1 ton if blue metal); and 1 cwt. No. 6 fence wire. The cost of these materials in Sydney is approximately £3 10s., so that the cost per post, materials only, reckoned at forty posts per yard would be 1s. 9d. each.

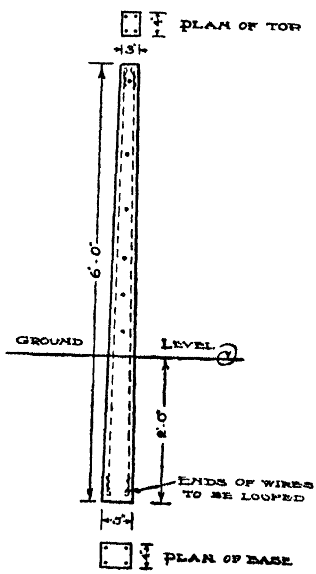
To gauge the materials for making the concrete, boxes specially made for the purpose will be a necessary part of the equipment, and the dimensions of these will depend on the size of the batch it is proposed to mix. Assuming that a half-yard batch would be the most convenient for farmers, the box for the metal should be 4 feet x 3 feet x 1 foot deep, and for the sand 3 feet x 2 feet 3 inch x 1 foot deep, internal dimensions. A box will not be necessary for the cement, as the above quantities call for two sacks of 124 lb. each. A half-yard batch will fill two moulds of the dimensions shown, and half of a third.

The method of placing the concrete and reinforcement is as follows:—Place a bed of concrete ¾ inch thick in each compartment. On top of this lay two reinforcing wires, placed ¾ inch from each partition, fill on top of this with concrete to within ¾ inch of the top, place two more wires as before, and fill to the top. It is essential that the concrete be well packed, but in a manner that will not damage the mould. When the mould is filled, take a timber straight-edge and scrape off the surplus material. It will usually be found necessary to add small quantities of fine stuff here and there to get an even surface. Now take short lengths ⅜ inch diameter steel, and drive them through the wet concrete to form holes for the fencing wire, but take care to withdraw them before the concrete grips them too hard.

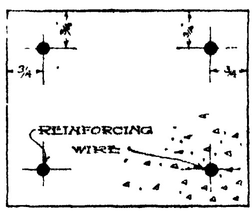
After casting, the concrete must be left to harden. To get the best results it must be protected from the sun or hot, drying winds for about three days by means of bags kept wet. If frosts are likely, these wet bags should be replaced at night with dry ones.



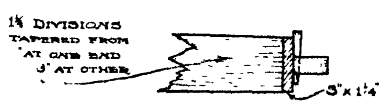
Sketch of Moulds for Concrete Posts.



Details of a Post.



Detail showing Position of Reinforcement.



Detail showing Mortise Tenon and Pin.

It is important that the moulds be drawn a few hours after the concrete has been poured, otherwise they will be difficult to get apart. It is essential that the mould when taken apart shall leave the concrete freely, and without pieces adhering to its sides. This is facilitated by thoroughly coating

the forms with oil. Creosote oil is cheap and quite suitable for the purpose. A thorough scraping and oiling of the forms should be done each time the moulds are to be filled.

Concrete is a material of proven worth. It possesses certain characteristics which call for some small amount of care, and given this, satisfactory results will be obtained.

The following points might be noted:—

Work clean.

Have proper boxes for gauging the material.

Have a good clean site, preferably a wood or concrete floor, on which to mix the concrete.

Mix the materials thoroughly by turning them over twice in a dry state, then twice whilst adding the water.

Add the water gradually, and through a sprinkler if possible.

Neither an insufficiency nor an excess of water is desirable. It should not be so dry as to require tamping, as when of the correct consistency it may be consolidated easily with a small spade.

Pack the concrete with the purpose of making it solid, and also to obtain clean surfaces.

Make the moulds substantial, so that they will not yield under pressure of packing.

Thoroughly clean all moulds before filling.

Place the concrete in position immediately it is mixed.

Protect concrete from drying too rapidly and also from frosts.

Do not attempt to handle cast concrete while it is "green," but rather wait until it is quite certain that it is hard enough for the purpose.

Winter Dairying Increasing in U S.A.

A NUMBER of important changes in the production of dairy products in the United States during the period 1917 to 1925 have been noted by the Dairy Market Special of the United States Department of Agriculture. One particularly interesting feature observed is the seasonal trend of butter production. If the year is divided into two parts, namely, the feeding season (November to April—the winter months) and the grass season (May to October—the summer months), it appears that the trend has been toward an increased production of butter during the feeding (winter) season. In 1917 the proportion of creamery butter made in the feeding season was 36.1 per cent., but in 1925 the proportion had increased to 39.9 per cent. There was a sound reason for this change according to the Specialist. For example, in Minnesota in 1917, the average price of a balanced ration sufficient to produce a pound of butter was 24.96 cents, and in 1925, 21.6 cents. The average price of 92-score butter in New York in 1917 was 42.7 cents per pound, while in 1925 it was 45.3 cents. The feed cost had decreased 13.5 per cent., while the price of butter had increased 6.1 per cent. during the period.

Farmers' Experiment Plots.

MAIZE TRIALS, 1926–27.

Upper North Coast District.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

THE farmers who co-operated with the Department during the past season in conducting maize trials were :—

T. Grainger, Southgate Road, Grafton.
G. Parnell, Southgate, *via* Grafton.
D. S. Cowan, Great Marlow, Grafton.
V. Brown, Condong, Tweed River.
W. E. Richens, Upper Burringbar.
C. Olivor, Horse Ridges, Casino.
Miss E. Mitchell, Cawongla Road, Kyogle.
M. McBaron, "Riverview," Raleigh.
W. R. D. Fawcett, Bawra Road, Bellingen.
R. W. Hindmarsh, Wiaraga, Bellingen.
A. Connolly, Thora, *via* Bellingen.

Conditions during the past season were very unfavourable for early maize, but excellent for the late crops. The weather was extremely dry until December, then a superabundance of rain was experienced until March, when dry conditions again set in. As the result of the dry spring and early summer, early maize crops were practically failures; wonderful recovery was made in most cases, however, when the rain came, and sufficient grain was produced for farmers' own needs. The December rains came in excellent time for the planting of late crops, but weather conditions were so changeable that most farmers were unable to plant the whole of the area which they originally intended to put in.

The rainfall during the growing periods was as follows :—

RAINFALL.

	Grafton.	Grafton (Great Marlow)	Condong.	Upper Burringbar.	Horse Ridges.	Kyogle.	Bellingen.
1926—	points.	points.	points.	points.	points.	points.	points.
September	80	...	...	...	...	...	...
October	75	...	...	...	...	...	...
November	5	...	...	...	...	...	...
December	595	595	1,172	1,154	25	40	605
1927—							
January	1,155	1,155	2,724	3,399	1,320	1,390	1,424
February	58	58	430	420	1,072	443	322
March	...	254	1,120	776	408	678	643
April	...	292	339	434	285	429	711
May	...	123	Nil	25	Nil	Nil	3
June	...	...	...	205	172	277	70
Total	1,968	2,477	5,785	6,413	3,282	3,257	3,778

The Scope of the Experiments.

The usual variety trials were conducted and in addition, in view of the high prices usually obtained for maize put on the market about the end of December, trials were commenced last season in the Clarence River district, with the object of determining which of the very early varieties, are most suitable for the district for the production of grain, for that market.

Leaming is the standard early variety on the Clarence, but it does not mature until about the end of January, with the result that very little early maize from the district reaches the market before early February.

The varieties tried out were Golden Glow, Star Leaming, and Golden Superb. Owing to the unfavourable season the plots made very little growth, and towards the end of the dry period appeared to be dying. When the rain came in December an attempt at recovery was made, and the varieties with the longer growing season, not being so far advanced in growth, had somewhat of an advantage. The continued wet weather after such dry conditions considerably delayed the maturity of these varieties.

Another variety which was tested for the first time in the district was Hempel, which was produced by a Victorian farmer, who claims it to be better than Funk's Yellow Dent, with which as well as other varieties it was compared. Planting was not carried out until late in the season. Hempel matured about six weeks earlier than Leaming, and although germination was faulty, it yielded fairly well producing a good sample of grain. Further trial should be given as a very early maturing variety.

In the late variety trials Fitzroy and Ulmarra Whitecap again demonstrated their yielding ability. At Horse Ridges, Yellow Hogan gave best results.

The Plots.

Southgate Road.—Soil alluvial loam, previous crop maize. The land was ploughed end of May, early August, and again just before planting, when harrowing and rolling were also carried out; planted 1st September, 1926; harvested 1st March, 1927.

Southgate.—Soil alluvial loam; previous crop maize. Land ploughed early in August and reploughed, harrowed and rolled just prior to planting; planted 1st September, 1926; harvested 1st March, 1927.

Great Marlow.—Soil alluvial loam; previous crop potatoes. Land ploughed and harrowed in November and harrowed just prior to planting; planted 10th December, 1926; harvested 14th May, 1927.

Condong.—Soil alluvial loam; previous crop winter fodder. Ploughed July, August, and just before planting; owing to unfavourable weather conditions planting was delayed until 7th December, 1926; harvested 19th May, 1927

Upper Burringbar.—Soil yellow clay loam; previous crop oats. Land ploughed October and November and harrowed; planted 16th December, 1926; harvested 28th June, 1927.

Horse Ridges.—Soil, heavy black volcanic; previous crop maize. Ploughed September and early December, harrowed and drilled; seed dropped by hand and covered with plough; planted 28th December, 1926; harvested 29th June, 1927.

Kyogle.—Soil, heavy black volcanic; previous crop maize. Land ploughed August and November and harrowed after each ploughing; planted 27th December, 1926, harvested 30th June, 1927.

Raleigh.—Soil alluvial loam; previous crop oats. Land ploughed, disc-harrowed and harrowed in November and December; planted 15th December, 1926; harvested 14th June, 1927.

Bellingen.—Soil alluvial loam; previous crop Berseem clover. Land ploughed in September, harrowed twice and disc-harrowed just before planting; planted 4th December, 1926; harvested 17th June, 1927.

Bawra Road.—Soil yellowish clay loam; previous crop Saccaline sorghum. Land ploughed early in October, harrowed, rolled and harrowed just before planting; planted 7th December, 1926; harvested 16th June, 1927.

Thora.—Soil, alluvial loam; previous crop maize. Land ploughed and harrowed in July, springtooth cultivated in August, ploughed and harrowed in September, knife cultivated in October, and harrowed just prior to planting; planted 7th December, 1926; harvested 15th June, 1927.

VARIETY Trial Results.

Varieties.	Southgate Road.	Southgate.	Great Marlow.	* Condong.	* Upper Burringbar	* Horse Ridges.	Kyogle.	* Raleigh.	* Bawra Road.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Golden Glow ...	21 24	22 22	...	...	...	...	...	...	...
Iowa Silvermine ...	...	...	...	37 8	...	...	.	...	..
Golden Superb ...	33 14	28 6	...	31 7	...	..		...	..
Hempel	.	...	52 54	...	...	...	..	...	...
Funk's Yellow Dent ...	...	...	84 19	55 0	...	...	..	...	...
Star Leaming ...	27 54	25 8	...	...	...	...	..	...	...
Leaming	33 14	38 32	91 15	63 0	...	...	...	...	...
Golden Beauty ...	...	...	76 24	56 26	57 15	51 15	27 32	67 47	51 34
Golden Nugget ...	...	...	...	...	60 3	...	...	...	...
Yellow Hogan ...	...	..	...	...	...	54 6	49 17	98 5	82 45
Fitzroy	...	...	...	...	75 20	42 24	59 40	102 29	107 14
Pride of Hawkesbury ...	...	...	...	...	...	51 15	...	...	...
Large Red Hogan	...	...	...	...	...	...	49 17	...	...
Ulmarra Whitecap	...	...	...	...	70 49	41 14	53 24	105 26	103 11

* At Condong, Upper Burringbar, Horse Ridges, Raleigh, and Bawra Road, superphosphate was applied at the rate of 2 cwt. per acre; the remainder of the plots were unmanured.

The Fertiliser Trial.

From the table of results it will be seen that the average increase obtained over the seven experiments due to the application of 2 cwt. superphosphate per acre was 11 bushels 41 lb. per acre. Assuming that superphosphate costs 8s. per cwt., and valuing maize at 5s. per bushel (a very reasonable figure

considering the prices obtained during the past season), it will be seen that for an outlay of 16s. per acre an increase of £2 18s. 8d. per acre was obtained, being a net gain of £2 2s. 8d. per acre.

MAIZE Fertiliser Trial.*

	2 cwt. superphosphate.	No manure.	Increase.
	bus. lb.	bus. lb.	bus. lb.
Condong	63 0	51 49	11 7
Upper Burringbar ...	75 20	61 6	14 14
Horse Ridges	42 24	42 24	......
Kyogle	84 48	59 40	25 8
Bellingen	88 28	87 1	1 27
Biwra Road	107 14	91 5	16 9
Thora	120 53	106 52	14 1
Average	......	......	11 41

* The variety used at each centre was Fitzroy, except at Condong, where Leaming was selected.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

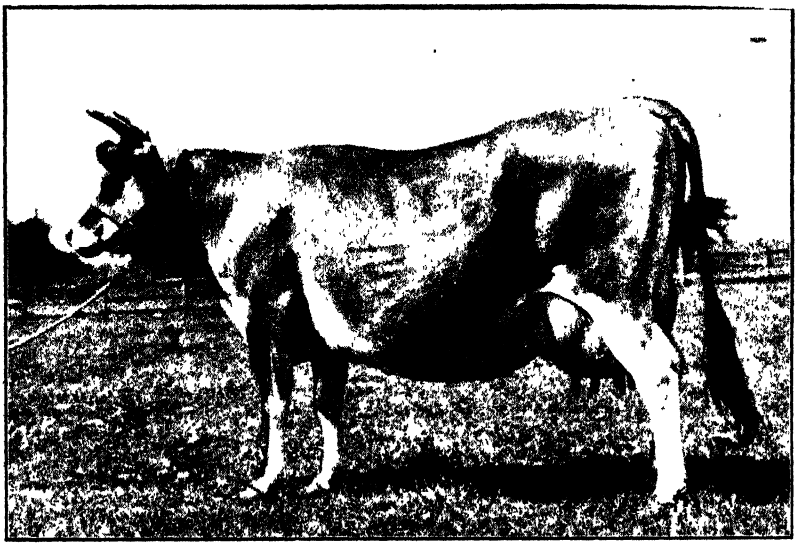
Owner and Address.	Number tested	Expiry date of this Certification.
New England Girls' Grammar School, Armidale	17	15 Nov. 1927
Lunacy Department, Rydalmere Mental Hospital	61	23 ,, 1927
Department of Education, May Villa Homes	6	8 Dec., 1927
Department of Education, Eastwood Home	10	8 ,, 1927
A. E. Collins, Hazelhurst Dairy, Bowral	13	6 ,, 1927
Miss Brennan, Arrankamp, Bowral	27	7 ,, 1927
Lunacy Department, Callan Park Mental Hospital	26	15 ,, 1927
Department of Education, Yanco Agricultural High School ...	26	12 Jan., 1928
A. V. Chaffey, "Lilydale," Glen Innes	15	25 ,, 1928
Lunacy Department, Kenmore Mental Hospital	99	1 Feb., 1928
Walaroi College, Orange	4	3 ,, 1928
Lunacy Department, Orange Mental Hospital	3	7 ,, 1928
Australian Missionary College, Cooranbong	51	11 ,, 1928
Department of Education, Gosford Farm Homes	18	18 May, 1928
William Thompson Masonic Schools, Baulkham Hills	34	31 ,, 1928
E. P. Perry, Nundorah, Parkville (Guernseys)	30	8 June, 1928
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	38	11 ,, 1928
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys) ...	70	16 ,, 1928
Department of Education, Mittagong Farm Homes	30	22 ,, 1928
Sacred Heart Convent, Bowral	11	23 ,, 1928
R. Burns, Wilga Glen Dairy, Coonamble	49	23 ,, 1928
Dominican Convent, Moss Vale	4	24 ,, 1928
Kyong School, Moss Vale	2	3 Aug., 1928
Riverstone Meat Co., Riverstone Meat Works, Riverstone ...	113	20 ,, 1928
Marist Brothers' Training School, Mittagong	80	25 ,, 1928
Blessed Chanel's Seminary, Mittagong	3	26 ,, 1928
Hygenic Dairy Company, Glenfield Farm, Casula, Liverpool ...	94	19 Oct. 1928
Kinross Bros., Minnamurra, Inverell (Guernseys)	78	5 Nov., 1928
Lunacy Department, Morisset Mental Hospital	16	8 ,, 1928
Department of Education, Hurlstone Agricultural High School ...	40	10 ,, 1928

—MAX HENRY, Chief Veterinary Surgeon.

Wagga Gladys, the Record Maker.

E. A. SOUTHEE, Principal, Hawkesbury Agricultural College.

On 15th October, 1927, Wagga Gladys, the 7-year-old Jersey cow of the Hawkesbury Agricultural College herd, completed 365 days' official test for a yield of 20,835 lb. milk, with an average test of 5.52 per cent. and 1149.385 lb. butter fat, which is equivalent to 1384.8 lb. commercial butter. This is an official world's record for both milk and butter fat production for



Wagga Gladys, of the Hawkesbury Agricultural College Jersey Herd.
Yield in 365 days: Milk, 20,835 lb.; butter fat, 1149·385 lb.

the Jersey breed. It was achieved on twice-a-day milking, whereas all the great records in other countries have been made on three and four milkings a day.

Wagga Gladys calved on 9th November, 1926, and on the day of her last periodical test she yielded 53.5 lb. milk and 3.694 lb. butter-fat in twenty-four hours.

Previous Records.

The previous world's official Jersey butter-fat record was held by Darling's Jolly Lassie, a 4-year-old, owned by Messrs. Pickard Bros., Oregon, U.S.A., which produced 16,425 lb. milk and 1141.3 lb. butter-fat (average

test 6.95) on four-times-a-day milking. The Australian Jersey butter-fat record was held by Mr. H. A. M'Donald's (Leeton) Daphne's Twylish of Glenrock, with 14,532½ lb. milk, 7.1 test, and 1029.15 lb. butter-fat. The best New Zealand record for the breed was that of Mr. W. T. Williams's Holly Oak's Annie, with 1,057 lb. butter-fat.

The previous world's official milk record for the breed was held by Madeline of Hillside, another American cow, which produced 20,624 lb. milk and 1,004 lb. butter-fat in 365 days, on four-times-a-day milking.

Previously the official Australian milk record for the breed, on twice-a-day milking, was held by Brighton Vanilla, owned by Mr. C. R. G. Macdonald, of Ingleburn, New South Wales, with 18,197 lb. milk (1,011 lb. butter), which has stood for the past ten years.

The Champion's Test Results.

The following are the milk and butter-fat yields of Wagga Gladys for each sub-period, all of which were of thirty days, except the last, which extended over thirty-five days:—

Date of Test.	Milk for Sub-period.	Butter Fat for Sub-period.
	lb.	lb.
7 December	1,830	91·53
5 January	1,830	87·03
1 February...	1,800	90·72
1 March	1,800	78·78
29 March	1,860	108·45
27 April	1,785	91·02
24 May	1,650	100·20
21 June	1,680	94·14
29 July	1,506	89·04
16 August	1,605	98·22
13 September	1,545	91·35
15 October	1,890	128·905
Total	20,835	1149·385

The ration fed to Wagga Gladys during the period of this test was indicated in the October issue of the *Agricultural Gazette* (page 780), in connection with the record of her 273-days' performance.

Four Consecutive Lactations.

Wagga Gladys was bred at Wagga Experiment Farm, where she was born on 15th October, 1919. She did not drop her first calf (at Hawkesbury College) until she was three years and two months old. Nevertheless, on her first lactation she produced 10,542½ lb. milk and 608¾ lb. butter-fat in 365 days.

The champion has yielded over 1,000 lb. butter on three consecutive previous lactations, and her production for four consecutive periods of 365 days is now as follows:—

Year	Milk.	Butter Fat.	Butter.
	lb.	lb.	lb.
1923	10542·5	608·74	733·4
1924–25	14950·0	838·01	1009·65
1925–26	15942·5	898·63	1082·68
1926–27	20835 0	1149·38	1384·8
Average	15567·50	873·69	1052·63

An average of over 1,000 lb. butter for four consecutive lactations is probably a world's record for any cow.

The accompanying photograph of Wagga Gladys is a new one, having been taken three weeks after the close of her fourth lactation period.

To Start a Small Apiary.

Though it may appear a little expensive to commence in the way described below, it should be remembered that if a start is made on right lines with the right class of material and well-bred bees, the extra cost above that of the purchase locally of a couple of full colonies will be well repaid, and there will be the additional surety of freedom from disease.

To commence a small apiary of up to thirty colonies, it would be advisable to obtain the following material to cover the needs of two colonies. The costs would be approximately those indicated.

	s.	d.
2 10-frame hives complete	16	0 each.
3 lb. comb foundation (full sheets) for placing in the frames to produce comb	3	0 per lb
1 ½-lb. reel of tinned wire for placing in the frames to brace the comb foundation	2	3
1 Daisy foundation roller, for fastening the comb foundation on the top bars of the frames	0	9
1 Spur wire embedder for fastening the wire on to the comb foundation	1	6
1 bee veil (black net)	2	6
1 bee smoker (2½ in. barrel)	5	6

As the colonies of bees are built up, additional material will be necessary, and later on when there are prospects of surplus honey being obtained a small honey extractor, a small honey tank, and two uncapping knives, should be purchased.

Two nucleus colonies of bees should be purchased from the Departmental apiaries, or private breeds of bees. The bees, combs, &c., of the nuclei are transferable to the factory-made hives. The price for the nuclei is 32s. 6d. each, freight paid.

It would also be advisable to obtain the literature published by the Department, including the bulletin, "The Beginner in Bee Culture," for which a charge of 10d. (including postage) is made.—W. A. Goodacre, Senior Apiary Instructor.

Farmers' Experiment Plots.

SWEET SORGHUM TRIALS, 1926–27.

The Northern District.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

THE following farmers co-operated with the Department in conducting fodder sorghum trials last season:—

H. A. Wilson, Borambil, Quirindi.
J. I. Williams, Mount Olive, Singleton.
Miss N. Edwards, Greenlands, Singleton.
L. Dunford, Mount Olive, Singleton.
Frank Andrews, Greenlands, Singleton.
A. G. and E. C. Andrews, Mount Olive, Singleton.

The Singleton plots were carried out under the auspices of the Mount Olive Branch of the Agricultural Bureau. Led by Mr. John Moss, president, members took a very active interest in the work.

The sites for the location of the plots were chosen mainly on account of the uniform previous cropping and cultivation, so that comparable results would be possible. Each trial was a single plot comparison, but the number of centres gave an indication of the most promising varieties and fertilisers.

In every instance the soil is alluvial deposit, and the location subject to flooding in heavy rainfall periods, hence the organic matter in the soil is fairly maintained, the least so being the Greenlands plot. The plots were sown in drills about 30 inches apart, the rate of seeding being 8 to 10 lb. per acre.

The rainfall at the various centres during the fallow and growing periods was as follows:—

RAINFALL.

	Fallow period.	Growing period.	Remarks.
	points.	points.	
Mt. Olive (L. Dunford) ...	1,202	1,370	Excessive rain January and April.
Mt. Olive (J. I. Williams) ...	213	2,560	,, December, January and April.
Mt. Olive (Andrews Bros.) ...	1,550	1,370	,, January and April.
Greenlands (Miss N. Edwards)	1,000	1,370	,, ,, ,,
Greenlands (F. Andrews) ...	1,000	1,370	,, ,, ,,
Borambil (H. A. Wilson) ...	300	640	Absence of rain February and early March.

The Plots.

Mount Olive (Andrews Bros.).—The experiment was located on alluvial deep sandy loam. In 1925 the land was cropped with oats, which was harvested as green fodder. Ploughed in July 6 to 8 inches deep; again in September 6 inches deep specially to destroy couch; shortly afterwards harrowed three times to remove couch; ploughed again 6 inches deep in

October and harrowed twice, also mainly to destroy couch; springtooth cultivated twice on 2nd February, harrowed 3rd February, and sown the same day.

The seed was placed in a moist seed-bed in open furrows, and the ground harrowed immediately. Shallow inter-row cultivations were performed after 18th March, up to which date only 90 points of rain had fallen without germinating weed seeds or destroying the mulch.

Mount Olive (J. I. Williams).—Soil a medium loam, deep alluvial. In 1924 a good crop of sorghum was obtained, and in 1925 a poor crop of maize. Both crops were unfertilised. Land stocked during the winter. Ploughed

Sorghum Variety Trial at L. Dunford's, Mount Olive, Singleton

latter part of August 6 inches deep; again early September 6 inches deep; harrowed and rolled directly after; ploughed early October 6 inches; harrowed and rolled shortly before sowing. Variety trial sown 7th December; fertiliser trial sown 22nd December. A good stand resulted in the variety trial; the crop grew vigorously, and attained at harvest from 7 feet (Saccaline) to 9 feet (Honey and White African). The fertiliser trial was abandoned owing to the uneven stand.

Mount Olive (L. Dunford).—Soil a medium loam, deep alluvial. In 1925 an unfertilised crop of maize which had yielded poorly had been grown, and in 1926 an unfertilised crop of Sunrise oats, which produced a good crop of green fodder. Early November, ploughed 8 inches deep, and twice harrowed, when dry; again ploughed early December 8 inches deep, and shortly after rain, about Christmas, harrowed twice; springtined late January and again a week later; harrowed early February; sown 3rd February. By 18th March no weed growth or setting of the soil had occurred, and only one shallow inter-row cultivation was performed later. Portion of the crop grew to 11 feet high by 27th May.

Greenlands (Miss N. Edwards).—Soil, a light sandy alluvial. No fertiliser previously used, though the land has been cropped for a number of years. Ploughed 4 to 6 inches deep mid-December, 1926; ploughed 31st January, 1927; drills opened out and seed covered by harrowing 2nd February. Cultivated once between rows of crop and hand hoed once to remove occasional weeds. The heavy rains about Easter caused waterlogging of the greater portion and materially reduced the yield.

Greenlands (F. Andrews).—Soil, alluvial light sandy loam. In 1926 an unfertilised sorghum crop was grown for green fodder. Ploughed about Christmas, 1926, and again 6 inches deep and harrowed on day of planting, 2nd February. Harvested 26th May, when growth ranged from 4 feet to 7 feet and also varied in density.

A distinct line of variation was noticed after the crop came up, due to some previous soil treatment; the yields are therefore set out in two columns, the varieties in each group being fairly comparable.

Borambil (H. A. Wilson).—Soil, deep alluvial loam, very fertile. In 1925 an unfertilised crop of sorghum was grown. Ploughed August, 1926, 4 inches deep, harrowed twice directly after; again ploughed 3 inches deep in November and harrowed once. The second ploughing was to destroy weeds. Sown 19th December; two days after sowing 40 points of rain caused a good strike, and satisfactory growth continued until the latter part of January; from then till late in March the rainfall was deficient, causing stunting. In the latter part of March 300 points of rain caused a second growth, but dry conditions till May stunted this at about the same height as the first growth. Orange and Collier withstood the dry conditions best.

SORGHUM Variety Trials.

Variety.	Greenlands (Miss N. Edwards).	Greenlands (F. Andrews)	Greenlands (F. Andrews)	Borambil (H. A. Wilson).	Mt. Olive (J. I. Williams).	Mt. Olive (L. Dunford).	Mt. Olive (Andrews Bros.)
	t. c. q.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.
Honey	......	11 6	...	9 0	26 17	30 0	18 0
Sumac	10 0 0	...	13 0	...	...	22 0	12 0
Gooseneck ...	9 8 0	9 11	...	...	...	22 2	10 10
Sorghum No. 61	14 11 2	...	15 0	9 4	27 0	21 6	11 0
Collier	14 18 0	9 0	...	10 10	28 0	32 0	17 0
Saccaline ...	13 12 0	...	17 0	9 4	...	24 0	15 0
White African ...	......	...	...	10 0	27 14	...	...
Orange	......	11 16	...	12 0	24 11	21 0	13 0

Comment.

The most effective fertiliser contained superphosphate 10 parts and sulphate of ammonia 3 parts, although superphosphate alone produced but slightly less. Considering the cost, the superphosphate alone was most profitable.

Among the varieties the remarkable feature was the consistently high yields of Collier. At present, Saccaline is practically the only sweet sorghum grown about Singleton, but the test plots over the past two years have demonstrated other good varieties. There will be a considerable area sown to Collier this coming season.

SORGHUM Fertiliser Trials.

	Greenlands (Miss N. Edwards).			Mt. Olive (L. Dunford).			Mt. Olive (Andrews Bros.).		
	t.	c.	q.	t.	c.	q.	t.	c.	q.
No manure	12	5	0	23	10	0	13	10	0
*P3 224 lb. per acre	14	0	0	26	12	0	14	5	0
*M13 182 lb. per acre	14	0	0	26	12	0	12	6	0
*M3 180 lb. per acre	17	3	0	28	0	0	12	6	0
Superphosphate (17 per cent.) 140 lb. per acre	16	10	2	27	3	0	16	0	0

*P3 consists of 10 parts of 17 per cent. superphosphate and 3 parts each of sulphate of ammonia and sulphate of potash. M13 consists of 10 parts of 17 per cent. superphosphate and 3 parts of sulphate of potash. M3 consists of 10 parts of 17 per cent superphosphate and 3 parts of sulphate of ammonia.

Upper North Coast District.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

Farmers who co-operated with the Department in conducting trials during the past season were as follows:—

W. E. Richens, Upper Burringbar.
M. McAuliffe, Tregeagle, *via* Lismore.
Wm. Meston, Woodburn, Richmond River.
A. E. Collins, Lawrence, Clarence River.
M. D. O'Connell, Riverbyn, Coramba.
M. McBaron, Riverview, Raleigh.

During the early part of the growing season there was a superabundance of rain, while the later stages were fairly dry. The rainfall during the growing period was as follows:—

	Upper Burringbar.	Tregeagle.	Woodburn.	Lawrence.	Coramba.	Raleigh.
	points.	points.	points.	points.	points.	points.
November ..	...	...	...	...	Nil.	...
December ..	...	184	...	...	637	605
January	3,399	1,865	1,895	...	1,749	1,424
February ..	420	527	475	Nil.	338	322
March	776	942	577	218	1,803	643
April	434	637	344	227	95	711
May	25	...	Nil.	Nil.	...	...
June	205	...	345	111	...	...
Total ...	5,259	4,155	3,636	556	4,622	3,705

The Plots.

Upper Burringbar.—Soil, yellow clay loam; previous crop oats. The land was ploughed in November, harrowed in December, and reploughed and harrowed in January; planted 17th January, 1927. The plot was inundated by the flood at the end of January. The germination of Collier and White African was only fair. Harvested 28th June, 1927.

Tregeagle.—Soil, red volcanic loam; previous crop sorghum sown broadcast. Land ploughed September, November, and December, and harrowed after each ploughing; planted 21st December; harvested 14th April, 1927.

Woodburn.—Soil, alluvial; previous crop maize. Land ploughed in September, harrowed in December, disc harrowed and light harrowed just prior to planting on 5th January, 1927; harvested 1st July, 1927.

Lawrence.—Soil, alluvial; previous crop beans. Land ploughed and harrowed several times to get rid of couch grass, and reploughed, harrowed, and rolled just before planting; planted 8th February; harvested 24th June.

Coramba.—Soil, yellowish clay loam; previous crop turnips. Land ploughed, harrowed, and rolled just prior to planting; planted 25th October, 1926; harvested 22nd April, 1927.

Raleigh.—Soil, alluvial; previous crop oats. Land ploughed, disc harrowed, and harrowed in November and December; planted 15th December, 1926; harvested 20th April, 1927.

SORGHUM Variety Trials.*

Variety.	Upper Burringbar			Tregeagle.			Woodburn			Lawrence.			Coramba.			Raleigh.		
	t.	c.	q.	t.	c.	q.	t.	c.	q.	t.	c.	q.	t.	c.	q.	t.	c.	q.
Honey	14	14	2	13	9	0	13	7	1	25	2	3	15	4	3	23	3	2
Saccaline ...	12	11	3	11	11	2	13	11	0	26	5	0	14	18	2	20	12	2
Collier	11	13	3	10	4	1	12	14	2	20	13	3	33	15	3	23	9	2
White African ...	8	0	0	9	6	2	13	9	0		...		17	17	2	24	3	1
Selection No. 61 ..	8	12	3	13	12	3	12	13	2		...		12	3	2	21	2	1
Gooseneck ...	10	7	1	13	15	0	9	0	3		...		12	5	2	18	9	1
Sumac	8	4	0	8	16	3	6	17	0		...		6	9	3	7	13	1

*With the exception of Woodburn and Lawrence, superphosphate was applied at the rate of 1 cwt. per acre.

The yields obtained in the manurial trials were as follows:—

	Upper Burringbar.			Tregeagle.			Coramba.		
	t.	c.	q.	t.	c.	q.	t.	c.	q.
Superphosphate 1 cwt. per acre ..	11	13	3	10	4	1	33	15	3
No manure	8	8	3	6	7	2	31	4	3

It will be noted that there was an average increase, due to the application of 1 cwt. superphosphate per-acre, of 3 tons 4 cwt. 1 qr. per acre over the no-manure plots.

Handling Prunes in a Californian Packing House.

J. A. BALLANTYNE, Assistant Orchardist, Hawkesbury Agricultural College.

BECAUSE certain methods are used with success in California in the growing and final preparation of the fruit for market, it does not necessarily follow that the industry would be benefited in Australia by the practise of those same methods. It may be that by a combination of Californian and Australian methods in the handling of dried fruits in the packing house, the ideal may be obtained. It was found from tests and experiments carried out by the Department of Agriculture that pruning apricot and prune trees in Australia, on the lines adopted by the Californian growers, was not productive of the best results, but by a modification of their method to suit our own conditions, a better and more satisfactory mode could be arrived at.

The manner in which the fruit is grown, in addition to the method adopted in the packing houses, will be governed by conditions, climatic and otherwise. As an illustration it may be mentioned that in California, prior to grading and before packing, prunes are allowed to sweat in large open bins containing probably up to 30 tons; though devoid of any covering, these prunes will sometimes remain for months in this state—in fact the writer has seen prunes lying in these open bins for over nine months. Should such a procedure be followed in Australia, owing to the ravages of the dried fruit moth, the fruit would, in the course of a few weeks, become so "grubby" as to be unfit for human consumption.

Although occasionally met with in California, the dried fruit moth (*Plodia interpunctella*) does not breed so rapidly as in Australia, and the packing house managers do not run any great risk of their fruit becoming "grubby" through the ravages of this insect. Other moths are to be found which attack the dried fruits, but in comparison with the dried fruit moth (*Plodia interpunctella*) in Australia, the damage done is practically negligible.

Many factors will influence the manner in which the dried fruit should be handled. The differences in soil and climatic conditions will have a marked influence over the method to be adopted. The amount of available fruit, proximity to markets, labour conditions, and diseases, are only a few of the agents that control the operations in the packing houses.

In California, owing to the large number of independent dried-fruit packers operating, in addition to the associated or co-operative houses, the methods used by the packers in handling the dried fruits vary slightly; and again, although the grading machines used by the packers may be identical the ultimate packed grades will perhaps be slightly different; possibly one packer is turning out a sample of 40-50's, in which the average number

of prunes per lb. is 44; another packer may turn out a 40-50 grade, which averages 47 prunes to the lb., which means, of course, that his grade is of a lower standard than the 40-50 averaging 44.

The following method of handling dried prunes in the packing house is the method used by one of the biggest dried fruit companies in California:—On being received from the grower, the dried prunes are simply dumped into large bins and allowed to sweat. These prunes, as stated before, will remain in these bins for any length of time; in fact, they will be left in the bins until required to fulfil an order. It is a very noticeable feature of the dried fruit industry in California that in very few cases will any packer process or pack the fruit until the order has been received, and the fruit receives its final preparation a day or two prior to the f.o.b. specified date.

Grading and Testing.

The grader used in practically all the large packing houses sizes the fruit into nine grades, the largest of the prunes going over the end of the grader (30-40's), and the smallest will go through the mesh into the first bin, these usually counting over 100.

It is interesting to note that the grower of prunes in California, owing to the nature of the soil and the manner in which the fruit has been specially prepared beforehand, does not shake the trees in harvesting. The prunes are allowed to drop, and special pickers are employed to collect and box the fallen fruit. This "picking up" accounts for the absence of leaves and twigs when the fruit reaches the packing house (after being dried by the grower), and it also explains why the grader is not equipped with any sort of blower or fan.

A Californian machine, with screens 48 x 48, and grading the prunes into nine sizes, would be capable of turning out 7 tons per hour. The Department of Agriculture has installed one of these graders, and it is giving great satisfaction at Yanco Experiment Farm. The machine is usually fixed about 3 feet from the ground, which permits barrows to be placed under it for the quick removal of the graded fruit.

Although the machines do very fine work, they cannot grade absolutely correctly, so that prunes which average, say, forty-seven to the pound will probably go through the same mesh and be mixed with those averaging, say, forty-nine to the pound; but since the object of the manager or packer is to know precisely after grading that a certain bin contains so much fruit, averaging so many prunes to the pound, special testers are employed. These testers do nothing but count the prunes. The barrows beneath the grader hold about 3 cwt. of dried prunes, and usually four tests are taken to each barrow load. When the barrow is a quarter-full, the first count will be made to ascertain the number of prunes it takes to make a pound, when half-full a second test or count is taken, and so on until the barrow is full, when four distinct counts have been taken. These counts are added together, and the average is taken, which, should the counts read 37, 37, 38, 40, would read 38 prunes to the pound, the average for the 3 cwt. in the barrow.

The bins into which the graded prunes are dumped show differences of five to the pound, and would be marked, 32-36, 37-41, 42-46, 47-51, 52-56, and so on. In the case just mentioned, where we have a barrow load of prunes averaging thirty-eight, they would be dumped in the 37-41 bin.

When the bins are sufficiently full, the testers' records are taken, and the average count per pound in the whole bin is arrived at. For instance, the 37-41 bin may average 39 and the 42-46 bin perhaps 45 prunes to the pound.

Blending.

The next operation is the blending of the prunes to meet the requirements of different markets. The packer may have an order from England and one from Japan, and he knows from experience that to hold the market his consignment to the former place must be of a very good sample, while to the latter a slightly inferior quality prune would suffice. Perhaps, should a 50-60 prune be required for the English order, a grade would be packed averaging 53, while in the case of the Japanese order the 50-60 grade could average 57.

This blending takes place prior to processing, when the prunes which combined make the desired grade are dumped on a shaker, which, in the process of depositing the fruit on an elevator, mixes the fruit to make an even grade. Should a 50-60 prune, averaging 57, be desired and there be no bin marked as averaging 57, a mixture such as a 55 and 61 would do, the prunes being mixed in the proportion of two parts of the 55 grade to one part of the 61.

Processing.

The elevator carrying the prunes from the shaker (or mixer) takes the fruit to the processing machine.

The processing consists of an immersion in boiling water to which nothing is added. The length of immersion varies according to the variety and condition of the fruit, the smaller and drier quality receiving the longer dip. The processor in general use consists of a large, heavy, enclosed steel tank, in which a line of buckets or baskets is drawn through the boiling water. At the end of the processor the fruit is automatically dropped on to a further shaker, and the empty buckets return underneath. The machine is geared so that the length of time the buckets are submerged in the water may be varied.

Having completed the dip, the prunes are carried over this second shaker, which has perforated screens or slat bottoms, for the purpose of removing the outside moisture on the fruit. The prunes must now pass the final testing, which is really a checking over of the grades. The tester simply takes a count every few minutes to ensure that the proper count and desired grade are being boxed.

This final tester is in communication all the time with the blenders or mixers below, and should he find that the grade is decreasing or increasing, he immediately informs the blenders, who add a few more of the larger or smaller prunes, as the case may be, in order to obtain and maintain the specified grade

From the processor and second tester, the prunes are carried on a belt to the packers while still hot. The packing consists of filling the boxes to the desired weight, and usually 25 lb. prunes are packed in various sized boxes, the 25 lb. box being standard in California. Should the prunes be intended for overseas, say, Germany, they would be packed in a box to suit the trade, and marked in kilos. The boxes are paper-lined, usually with oiled paper, and the fruit is not really packed or faced in any way as in Australia. The weighing is generally done by machinery with a man adding or taking away a few prunes to make the proper weight.

The pressing and nailing are done by machinery.

IMPORTS AND EXPORTS OF FRUIT.

THE following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 30th September, 1927 :—

Description.	Imports.	Exports
Interstate.		
	Cases.	Cases.
Fresh Fruits .	420,719	106,383
,, Tomatoes..	122,760	...
,, Melons ..	...	53
	lb.	lb.
Canned Fruits ..	19,404	1,764
Dried Fruits—		
Unspecified ...	13,244	3,556
Currants	7,952	1,008
Raisins ..	7,672	672
Apricots ..	2,072	...
Apples ...	3,444	168
Peaches ..	1,624	...
Pears	392	
Prunes ...	1,120	336

Description	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals
Apples ..	....	...	502
Bananas ...	....	1,163	...
Lemons ..	....	122	1,136
Oranges ..	....	25	9,359
Pears ..	.. ..	...	97
Pineapples ...	....	..	1,229
Other	....	249	10,138
Dried Fruits—		lb.	lb.
Apples, Pears, Peaches, etc.	U.S.A.	18,664	...
Apples ...	....	...	316
Apricots ...	....	...	196
Currants .	....	...	102,428
Prunes ...	France	728	5,216
	United Kingdom	12	...
	U.S.A.	99,558	...
Peaches ...	....	...	128
Raisins—			
Sultanas ...	....	...	6,344
Lexias ...	....	...	128
Other ...	....	..	376
Dates	Mesopotamia ..	189,050	23,902
Other	....	...	2,573
	Asia Minor ...	3,513	...
	China	6,105	...
	New Zealand ...	93	...
	United Kingdom	821	...
	U.S.A ..	6,278	...
Preserved in liquid—			
Apricots ...	....	...	31,753
Peaches ...	....	...	47,023
Pears ..	....	...	3,771
Pineapples ...	....	...	2,579
Raspberries	....	...	4,296
Other ...	....	...	14,288

Raising Apple Seed.

W. Le GAY BRERETON, Assistant Fruit Expert.

The Orchardist at Bathurst Experiment Farm, has been very successful in raising apple seed in the following manner:—

The apples are allowed to mature well before picking and are then held in boxes, the seed not being extracted till they are sown in July. The bed the seed is sown in is made of new bush soil, in order to avoid trouble with weeds. When sown the seed is covered with ½ to ¾ inch sandy loam, and the bed is then thoroughly soaked with water and covered with bags. It is kept moist all the time by watering through the bags when necessary. When the shoots are just appearing through the soil, the bags are removed.

Mr. P. H. Thomas, Fruit Expert of Tasmania, who has had considerable experience in raising apple seed, states:—"We obtain better germination of apple seed by stratifying them during the autumn in wash sand, using shallow boxes or flower pots. These are exposed to the influence of the weather during the winter, and are sown in drills in prepared beds at about the end of August."

Though Mr. Thomas does not actually state that the sand the seeds are stratified in is kept moist, when exposed to the winter weather of Tasmania it would be so. It is an important point that the seed should not be allowed to dry out from the time the seed is extracted from the fruit till it is sown.

The after-ripening and germination of apple seed was investigated by George T. Harrington and Bertha C. Hite, scientific assistants in the Seed-testing Laboratories, U.S.A. Department of Agriculture. The following is extracted from a report published in the *Journal of Agriculture Research*, Vol. XXIII, No. 3, 20th January, 1923:—

"Apple seeds when taken from the apples at their maturity are incapable of germination. . . . Apple seeds acquire the power to germinate; that is, they after-ripen in a few months when kept moist at a temperature between 5 and 10 degrees Centigrade (41 and 50 degrees Fah.). They also after-ripen within the fruit in commercial cold storage (0°C), or in a cold cellar. They do not after-ripen in dry storage, or when kept moist at 20°C (68 degrees Fah.), or at a higher temperature. . . . The relation of oxygen to after-ripening was not determined, but apparently a good supply of oxygen is always present within the core of the apples when they are kept at low temperatures. . . . After-ripened seeds will germinate fairly well at 20°C (68 degrees Fah.), but not so well at 25°C (77 degrees Fah.) The optimum temperature for their germination seems to be somewhere between 10° and 20°C (50 and 68 degrees Fah.), and to vary according to the condition of the seed, or possibly according to the variety of apple."

The "cold cellar" quoted probably refers to a cellar in a very cold climate. It is possible that a cellar in our New South Wales apple districts would not be cold enough to after-ripen the seed whilst still inside the fruit.

It has been an old belief amongst some that seeds of apples must be exposed to a freezing temperature before sowing to make them germinate. The above investigations show this not to be necessary, but that they must be exposed to a certain fairly low temperature.

The practices at both Bathurst and Tasmania fulfil the conditions that the American investigations revealed to be necessary, as when extracted and sown shallow as early as July in this State's Tableland apple districts, or August in Tasmania, they would experience sufficient cold to after-ripen, and they would have the chance to germinate before the temperature became too high.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department not later than the 12th of the month.

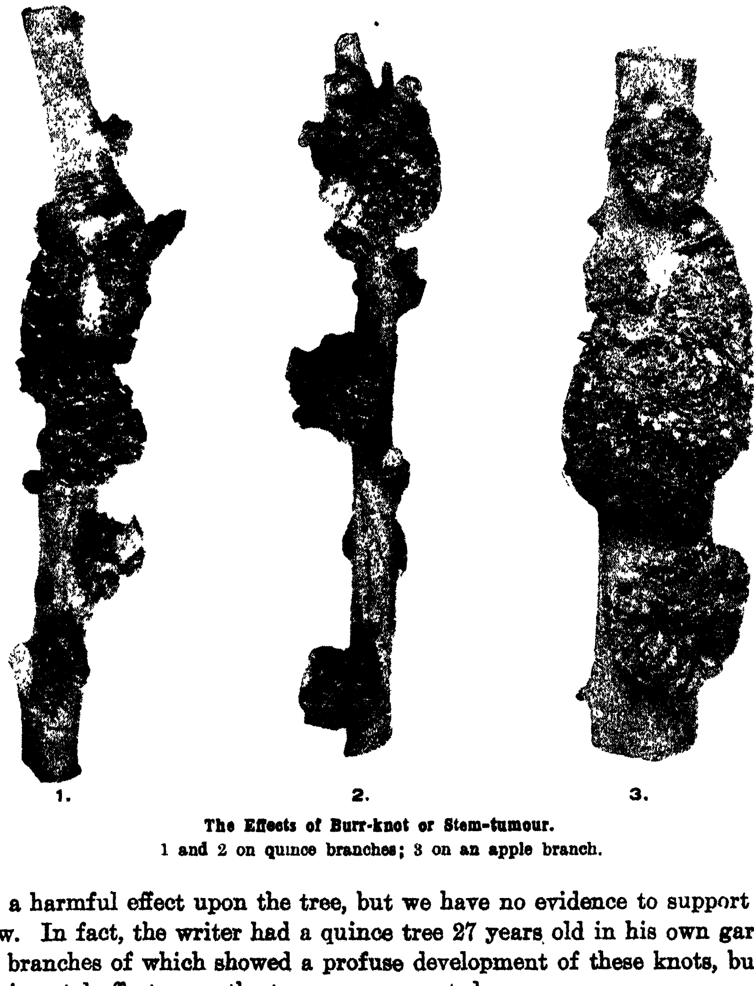
Wheat—	
Federation	W. Waite, Finley.
Waratah	W. Waite, Finley.
Oats—	
Mulga	Chaffey Bros., Nemingha.
Maize—	
Golden Glow	P. Kelly, Leech's Gully, Tenterfield.
Fitzroy...	Manager, Experiment Farm, Grafton.
Broom Millet	W. T. McDonald, Taree Estate, Taree.
Sweet Sorghums—	
Collier	Manager, Experiment Farm, Grafton.
Selection No. 61	Manager, Experiment Farm, Grafton.
Saccaline	Manager, Experiment Farm, Wollongbar.
	D. Shearer and Sons, Glendon, via Singleton.
White African...	Principal, H.A. College, Richmond.
Peanuts—	
Large White Spanish... ...	Manager, Experiment Farm, Grafton.
Soybeans—	
Biloxi	Manager, Experiment Farm, Grafton.
Otootan	Manager, Experiment Farm, Grafton.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Burr-knot or Stem-tumour of Quince and Apple Trees.

W. A BIRMINGHAM, Assistant Biologist.

FROM time to time growers in this State have submitted to the Biological Branch for examination, quince and apple branches showing roughened knots or outgrowths on the surface. From observations made in New South Wales these burr-knots are much more common on quince than on apple branches (Fig. 1). Some growers are of the opinion that their presence



1. 2. 3.

The Effects of Burr-knot or Stem-tumour.
1 and 2 on quince branches; 3 on an apple branch.

has a harmful effect upon the tree, but we have no evidence to support this view. In fact, the writer had a quince tree 27 years old in his own garden, the branches of which showed a profuse development of these knots, but no detrimental effect upon the tree was ever noted.

The opinion has been held here for a number of years that these outgrowths were only aggregations of dormant aerial or adventitious roots.* The work recently carried out in the United States of America support this contention. Woolly aphis as a possible cause of the knots can be eliminated, as quince trees are not attacked by it in New South Wales.

On 23rd of May, 1927, quince branches from the Hawkesbury district showing burr-knots were cut into 2-inch lengths and planted in soil in 4-inch pots and placed in a glasshouse. On 11th August, 1927, these pieces were lifted, showing the development of roots as illustrated in Fig. 2.

In 1908, Hedgcock (1) recorded a peculiar form of tumours or knots on the trunks, limbs, and twigs of apple and quince trees in a number of localities in various portions of the United States. He states: "Upon inquiry, the owners claimed that such trees (in the Mississippi Valley) usually bore as well as other trees in the orchard, and from all indications they were making as good growth as other trees. . . . The quince trees

Burr Knot in Quince.
Observe the development of adventitious roots.

in California appear to be quite universally affected with this disease, though usually with only a mild form. No indication has been found that the disease spreads in the orchard from one tree to another, either in the case of apple or quince trees, and experiments in which inoculations were made with chips from living tumours indicate that it is either very little or not at all contagious."

Brown (2) in her paper on "An Apple stem-tumour not crown gall," says: "The outgrowths vary in size from small warts to tumours inches in diameter. . . . These tumours resemble in appearance those produced by the crown gall organism. . . . Attempts to isolate the crown

* Roots growing out of their usual or proper place.

gall organism from apple stem-tumours always have been unsuccessful. . . . The cases of apple stem-tumour from various parts of the United States examined by the writer did not contain the crown gall organism in a single instance."

In 1925, Swingle (3) recorded burr-knots on apple, quince, and other trees. He states:—" There seems to be no correlation between the presence or absence of burr-knots and the health and vigour of the tree. . . . The occurrence of such burr-knots is entirely a varietal characteristic, and is distinct from the (hairy root) form of crown gall. . . . It is possible that many individual trees are discarded annually because of the confusion of burr-knot with hairy root. . . . In the case of the apple, the age at which the knots first make their appearance varies with the variety."

To Summarise.

There is no evidence to show—

1. That burr-knot on quince and apple trees is due to a parasitic organism, or that the condition is contagious.
2. That they have any detrimental effect upon the tree.
3. There is definite evidence to support the view that burr-knots or stem-tumours are aggregations of dormant aerial or adventitious roots.

The writer is indebted to Mr. M. A. Byrne, Orchard Inspector, Brooklyn, for the quince specimens, to Mr. C. F. Pfeiffer, Comboyne, for the apple branch shown in the illustrations, and to Mr. P. Maguire, Biological Branch, for the photographs.

Literature Cited.

1. Hedgcock, G. G.—Stem-tumours of apple and quince trees. Circ. No. 3, U.S. Dept. of Agriculture, 1908.
2. Brown, N. A.—An apple stem-tumour not crown gall. *Jour. Agr. Res.*, 27; p. 695, 1924.
3. Swingle, C. F.—Burr-knot of apple trees. *Jour. Heredity*, 16; p. 313, 1925.

To Improve the Strain of Pigs.

The average pig-raiser cannot at a moment's notice dispose of his mongrel, low-type sows and replace them with the desirable, profitable kind. He cannot afford to do so, but he can start on a new forward policy of improving his stock, and the first thing to do without any doubt is to secure a pure-bred, well-shaped boar of a breed suitable to mate with the sows. The aim is to remedy the faults of the sows *in their litters*—to get bigger and better litters—better shapes, better market quality meat, and vigorous and healthy growers. The boar will do this, but the boar must be pure bred and of good type, and the only guarantee of purity is registration in the herd book. The progeny of a pure-bred boar mated to mongrel sows are stamped with their sire's characteristics. They are better-shaped, have better constitutions, are better-fleshed, and are "better doers." This means higher prices per lb. and cheaper feeders.—P. G. Hampshire, in the *Journal of Agriculture*, W.A.

Sheets for Fumigating Citrus Trees.

J. D. BRYDEN, Assistant Orchardist, Yanco Experiment Farm.

SHEETS used for the fumigating of citrus trees are by no means inexpensive, and care should be taken to see that they are handled in a proper manner, both when in use and when in store. Sheets should not be put away wet or even damp, but should be perfectly dry and properly folded and suspended from a rafter, out of the way of mice, &c. Similarly, in the orchard damp sheets should never be folded, but should be spread out as soon as possible and allowed to dry.

It is also important that the sheets be absolutely dry when fumigating operations commence. Damp sheets, besides being much harder to handle, tend to hold the gas, and are often the means of causing severe injury to the tree—having the same effect as an overdose of gas.

If sheets are given the amount of attention they need, they will last for years, and it is important to bear this in mind when purchasing, for the sizes will need to be such as will cover the trees at the end of this period, and not merely large enough to cover the trees at the time of purchase of the sheets. The practice of buying small sheets is a false economy. Too much stress cannot be laid on the necessity of having all the sheets large enough to cover any tree in the grove, unless there are one or two trees very much larger than the rest. A great deal of time is lost and inconvenience experienced during fumigating operations where even only one or two sheets used in the outfit are small, and the operation is rendered costly and dangerous. Time is wasted finding a tree which the small sheet will cover, or in the adoption of the alternative of leaving small trees and having to come back and "spot" them.

The following table shows the different sized fumigation sheets needed for various sized trees. The size given is the diameter of an octagonal sheet:—

Size of tree.	Size of sheet required.
Up to 6 ft. high and 6 ft. diameter ...	25 ft. square.
,, 9 ,, 9 ,, ...	30 ,,
,, 10 ,, 10 ,, ...	35 ,,
,, 12 ,, 12 ,, ...	40 ,,
,, 14 ,, 14 ,, ...	45 ,,
,, 16 ,, 16 ,, ...	50 ,,

Very few trees of standard varieties will be found to be larger than 16 feet in height and 16 feet in diameter, so that it will be found that a 50-feet sheet will, with few exceptions, cover the higher trees in any grove.

Analysis of Lead Arsenates of Various Brands.

A. A. RAMSAY, Chief Chemist.

AN examination has been made of such brands of arsenate of lead as were procurable on the local market in July, 1927, and the results are given in the accompanying tables.

In Table I the composition of the lead arsenate as sold is set forth, and in Table II the results are expressed on a "dry" or "moisture-free" basis. This enables comparisons to be made, and in guarantees furnished by the manufacturers the composition is usually stated in this form. Table III indicates the relative amounts of diplumbic and triplumbic arsenates present, and Table IV gives the rates at which settlement takes place from an aqueous suspension of the lead arsenate.

The chemistry of lead arsenates has been given at some length in previous articles*, and may be referred to by those interested. More recent experimental work in America indicates that a lead arsenate of the composition $PbH_4 (AsO_4)_2$ or $PbH AsO_4.H_3 AsO_4$ has been formed in very small quantity by boiling very small quantities of diplumbic arsenate in relatively large quantities of arsenic acid, and allowing to crystallise. The product is very unstable, and gives up arsenic acid on solution in water. From the method of preparation, it appears to be very unlikely that this compound would be present in lead arsenates as ordinarily manufactured.

A more basic lead-arsenic acid compound has been produced by the action of ammonia on diplumbic arsenate. The composition has not yet been definitely established, but $3\ Pb_3 (AsO_4)_2.PbOH_2$ has been suggested. From the method of preparation it does not appear very likely that those compounds would be present in lead arsenates as ordinarily manufactured.

The preparation of chemically pure triplumbic arsenate, or of chemically pure diplumbic arsenate is comparable to the preparation of tricalcium and dicalcium phosphates, and is by no means easy. The product formed, except under very particular conditions and circumstances, is usually a mixture of the tri- and di- compounds.

Nine samples have been examined, six of these being in paste form, and three in the form of dry powders. Of the paste forms examined the moisture content ranged from 49 to 54·8 per cent., the average of all being 50·86; the arsenic acid content ranged from 14·84 per cent. to 16·79 per cent., the average being 15·83 per cent. and the lead content from 28·52 to 32·67, the average being 31·37. In order to enable a strict comparison to be made,

* Analysis of Various Lead Arsenates, *Agr. Gaz. N.S.W.*, vol. 21, p. 955; Composition of Various Lead Arsenates, *Agr. Gaz. N.S.W.*, vol. 31, p. 208.

the ranges and averages calculated on a moisture-free basis are given. Arsenic acid content ranges from 30·8 to 33·05, averaging 32·23 per cent., and the lead oxide from 62·85 to 65·73, averaging 64·17 per cent. Of the powder forms examined the moisture content ranged from 0·2 to 1·6, averaging

TABLE I.—Composition of Lead Arsenate as purchased.

Brand.	Moisture.	Lead Oxide PbO.	Arsenic as AsO_3.	Not determined. (by difference).
"Vallo"	49·02	33·21	15·70	2·07
Swifts	50·29	32·67	15·68	1·36
"Bluebell" (paste)...	50·55	31·09	16·08	2·28
"Bluebell" (powder)	1·60	62·58	32·08	3·74
"Orchard" ...	0·40	63·91	31·62	4·07
"Mercury" ...	54·80	28·52	14·84	1·84
"Elephant" ...	51·32	31·14	15·88	1·66
"Electro"	0·21	63·44	32 55	3·80
Hemmingways ...	49·19	32·62	16·79	1·40

TABLE II.—Composition calculated on a Moisture-free Basis.

Brand.	Moisture.	Lead Oxide PbO.	Arsenic as AsO_3.	Not determined (by difference).
"Vallo"	...	65·16	30·80	4·04
Swifts	...	65·73	31·55	2·72
"Bluebell" (paste)...	...	62·85	32·52	4·63
"Bluebell" (powder)	...	63·59	32·60	3·81
"Orchard" ...	...	64·17	31·75	4·08
"Mercury" ...	...	63·10	32·83	4·07
"Elephant" ...	...	63·98	32·62	3·40
"Electro"	...	63·57	32·62	3·81
Hemmingways ...	...	64·21	33·05	2·74

0·7; arsenic acid varied from 31·60 to 32·55, averaging 32·08, and the lead oxide content from 62·58 to 63·91, averaging 63·31 per cent. Expressed on a moisture-free basis the arsenic acid ranges from 31·75 to 32·62, averaging 32·32, and the lead oxide from 63·57 to 64·17, averaging 63·78 per cent.

The range in the amounts of lead oxide and arsenic acid present is due to the different forms of combination of these compounds; that is to say, to the different amounts of di- and triplumbic arsenates present. Lead arsenate is chiefly used as a spray against codling moth, and failure to obtain adequate control against that pest's attack has not infrequently been attributed to the quality of the lead arsenates used

In this connection a comparison of the analytical data on arsenates of lead available in 1910 (see *Agricultural Gazette*, January, 1910), in 1920 (see *Agricultural Gazette*, March, 1920), and in 1927 are not without interest:—

1910 arsenic acid present (calculated on moisture-free basis) ranged from 15·00 to 29·3 per cent., averaging 21·05 per cent.

1920 arsenic acid present (calculated on moisture-free basis) ranged from 25·45 to 29·93 per cent., averaging 28·05 per cent.

1927 arsenic acid present (calculated on moisture-free basis) ranged from 30·8 to 33·03 per cent., averaging 32·26 per cent.

Since 1910 the arsenic contents in the lead arsenates available has been increased by 49 per cent., and since 1920 by 15 per cent. Every effort appears to have been made by manufacturers to supply an arsenate of lead of superior quality and containing a high arsenic content, and it is reasonable to conclude that at the present time failure to obtain adequate control of codling moth is not due to inferiority in quality of the lead arsenates.

TABLE III.—Amounts of Di- and Triplumbic Arsenate Present.

	Composition			Percentages of total arsenates.	
	Di-plumbic Arsenate.	Tri-plumbic Arsenate.	Not determined.	Di-plumbic.	Tri-plumbic.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
"Vallo"	75·459	22·461	2·080	77·06	22·94
Swifts	80·464	18·906	0·630	80·97	19·03
"Bluebell" (paste)	97·910	...	2·090	100·0	...
"Bluebell" (powder)	96·619	2·080	1·301	97·89	2·11
"Orchard"	87·132	11·051	1·817	88·74	11·26
"Mercury" ...	98·499	...	1·501	100·0	...
"Elephant" ...	95·587	3·496	0·917	96·47	3·53
"Electro"	96·864	1·842	1·294	98·13	1·87
Hemmingways ...	98·758	1·069	0·173	98·93	1·07

It will be noted that in the above series, about two-thirds of the products are essentially diplumbic arsenates (or contain minute qualities of triplumbic arsenate), and that the remainder are mixtures of di- and triplumbic arsenates in varying amounts, ranging from 13 to 30 parts triplumbic arsenate per 100 parts diplumbic arsenate.

It will be of interest to compare the composition of those brands of lead arsenates examined in 1920 and also in 1927. The data is set forth in the table below:—

Brand.	1920.		1927.	
	Diplumbic Arsenate.	Triplumbic Arsenate.	Diplumbic Arsenate.	Triplumbic Arsenate.
	Per cent.	Per cent.	Per cent.	Per cent.
"Vallo"	46·6	53·4	77·1	22·9
Swifts	35·2	64·8	81·0	19·0
"Bluebell" ...	77·8	22·3	100·0	...
"Orchard" ...	43·7	56·3	88·7	11·3
"Mercury" ...	85·1	14·9	100·0	...
"Electro"	82·1	17·9	98·1	1·8

In every case the product contains a higher percentage of diplumbic arsenate than was contained in the same brand in 1920, and as field trials in America have shown that the killing power of diplumbic arsenate is greater than that of triplumbic arsenate, it is reasonable to suppose that the killing power of the arsenate of leads now available has been materially improved. Table IV is self explanatory and need not be discussed at length. The examination of the brands of lead arsenate available shows that so far as chemical composition is concerned the arsenates are markedly superior to those previously available.

TABLE IV.—Rates of Settlement in Lead Arsenate Suspensions.

Period allowed.	"Vallo."	Swifts.	"Bluebell" (paste).	"Bluebell" (powder).	"Orchard."	"Mercury."	"Elephant."	"Electro."	Hemmingways.
5 min. ...	75·36	68·0	72·56	35·04	45·76	73·2	48·72	76·80	57·12
15 min. ...	80·48	78·48	79·36	56·0	60·16	83·20	69·20	91·12	70·8
30 min. ...	90·72	80·56	89·76	67·36	66·24	88·32	81·44	95·28	95·20

The analytical work has been carried out by Messrs. L. Musso and A. V. Robinson, B.Sc. Agr.

INFECTIOUS DISEASES REPORTED IN OCTOBER.

THE following outbreaks of the more important infectious diseases were reported during the month of October, 1927:—

Anthrax ...	1
Pleuro-pneumonia contagiosa ...	8
Piroplasmosis (tick fever) ...	Nil.
Blackleg ...	Nil.
Swine fever ...	Nil.

—MAX HENRY, Chief Veterinary Surgeon

PEDIGREE PIG PRICES.

MANY people—and particularly those who do things on quite a small scale—still seem to think that pedigree pigs are simply for those who can afford to pay fancy prices. This is very far from being the case, for every pedigree breeder must always have a certain number of "throw-outs" which he is willing to sell at commercial prices. Such pigs, although not quite good enough for breeding are usually a good deal better than the ordinary run of pigs offered at the market, and are invariably worth a few shillings more. This is because "pedigree" is these days simply means "selection"—the result of the pedigree breeder's continual effort to produce the very best type of pig possible from the utilitarian standpoint.—*Pig-breeders' Annual.*

Sugar Cane Fertiliser Trial.

Wollongbar Experiment Farm.

R. N. MEDLEY, H.D.A., Experimentalist.

THIS experiment was planted at the Duck Creek Farm in November, 1923, and was first harvested on 12th January, 1926. The results were encouraging and the crop was allowed to ratoon with the object of ascertaining the residual effect of the various fertilisers.

The soil on which the experiment was located is of a heavy, black, peaty nature, well suited to cane-growing, and considered typical of the cane-growing areas of the Lower Richmond River. The sets had been planted 18 to 24 inches apart in rows 4 feet 9 inches apart, the variety used being Malabar, and the fertilisers were applied on 26th February, 1924. The experiment was laid out as follows:—

- Plot 1.—No manure—check.
- Plot 2.—Superphosphate, 5 cwt. per acre.
- Plot 3.—Superphosphate, 5 cwt.; nitrate of soda, 1½ cwt. per acre.
- Plot 4.—No manure—check.
- Plot 5.—Superphosphate, 5 cwt.; sulphate of ammonia, 2 cwt. per acre.
- Plot 6.—Superphosphate, 5 cwt.; sulphate of ammonia, 2 cwt.; lime, 5 cwt per acre.
- Plot 7.—No manure—check.

Each plot consisted of five rows, 308 links long.

The 1926 and 1927 seasons were not favourable ones for cane-growing on the Richmond River on account of very dry periods alternating with excessively wet ones, resulting in light crops during the present harvest in many cases. The rainfall figures for each month were as follows:—

RAINFALL.

1926	Points.	Wet days	1927—	Points.	Wet days
January 12th-31st ...	151	8	January	1,918	15
February	89	6	February	881	7
March	650	11	March	921	23
April	581	8	April	631	10
May	520	12	May	—	—
June	642	15	June	203	6
July	291	7	July	64	2
August	100	5	August 1st-18th ...	—	—
September	204	11			
October	83	7	Total	8,621	170
November	22	2			
December	670	15			

The lateness of the harvesting of the crop in the 1925-26 season—mid-January—had a very adverse effect upon the yields of cane in this season's harvest, (1) because of the insufficient time for the crop to recover from the effects of harvesting before the cool season set in, and (2) because the growing season was restricted to nineteen months instead of twenty-two to twenty-four months as would have been the case had the cutting been earlier in the 1925-26 season.

As a consequence of the adverse climatic conditions and of the lateness of the previous harvest, the yields were very light. The crop was harvested on 18th August, 1927, and was healthy except for an occasional diseased stool; it had attained an average height of 5 feet 6 inches. The results in order of merit, based on percentage yield, were as follows:—

	tons	cwt.	qrs.	lb.
Plot 5.—Superphosphate, 5 cwt.; sulphate of ammonia, 2 cwt.	16	3	0	13
Plot 3.—Superphosphate, 5 cwt.; nitrate of soda, 1½ cwt....	15	1	2	15
Plot 2.—Superphosphate, 5 cwt.	14	11	3	14
Check plots (no manure)—average	13	8	1	2
Plot 6.—Superphosphate, 5 cwt.; sulphate of ammonia, 2 cwt.; lime, 5 cwt.	10	10	1	2

The differences due to the action of the fertilisers were, therefore, as follows:—

	tons.	cwt.	qrs.	lb.	
Plot 5	2	14	3	1	increase.
Plot 3	1	13	1	13	,,
Plot 2	1	3	2	12	,,
Plot 6	2	7	3	0	decrease.

The yields of the check plots were fairly uniform, varying from 1,476 lb. to 1,564 lb. Contrary to the yields obtained from the harvest of the plant crop in January, 1926, the plot which received a dressing of lime showed a marked decrease in yield; this result seems to correspond with those obtained in fertiliser trials previously conducted by the Colonial Sugar Refining Co., Ltd., on Lower Richmond River cane land.

The differences in yield between the check and fertilised plots, other than the plot to which lime was applied, are sufficient to indicate a residual effect for the various fertilisers used, and that it is quite pronounced in the first ratoon crop.

The Value of Lightning Rods.

A committee of three officers of the United States Department of Agriculture recently issued a statement in regard to lightning-caused losses on farms. According to the statement "Available statistics indicate that lightning rods, both good and defective, as hitherto found on farm buildings have reduced lightning losses by about 85 per cent. of the loss incurred from lightning on corresponding exposures of unrodded buildings, and that properly installed and well-maintained rods have shown an efficiency in the prevention of lightning damage of well nigh 100 per cent.

"A substantial metal roof with all parts thereof in good electric contact can, according to available evidence, be utilised as a part of the lightning-protection system for a building, and thus in part be made to serve a double purpose. The cost of grounding and making other necessary electrical contacts with interior masses of metal is relatively small.

"The cost of lightning protection is more than justified when the added personal safety and avoidance of temporary deprivations, as well as the saving of property, are considered."

Poultry Notes.

DECEMBER.

JAMES HADLINGTON, Poultry Expert.

It has been suggested to me that as this is the last opportunity I shall have of addressing readers of these Notes in an official capacity, I should briefly review some of the principal changes which have taken place in the poultry industry and remind poultry-farmers of some of the reforms which have been advocated in these Notes during the fourteen years of their issue. This must be my apology, if such is needed, for what follows. Space will not permit of anything like a comprehensive review of even the principal events of the time, but simple reminders will doubtless serve to revive interest in those items of policy which have not yet been brought to fruition, because, notwithstanding the progress which has been made, a great deal remains to be done before the poultry industry comes into its own.

The appointment by the Department of a Poultry Expert in 1913 to look after the interests of those engaged in poultry-keeping was the initial move towards placing the industry upon a more even footing with other primary industries. From that time onward the industry, although it has suffered many drawbacks, has made wonderful progress and the value of poultry products has risen from £1,400,000 in 1913 to £3,200,000 in 1926. Prior to 1914 the industry as it is known to-day barely existed; there was a tendency to look upon poultry-keeping as a side line proposition, and even where poultry-farming was specialised in, the equipment was for the greater part of a primitive nature, lacking in system, and without regard to labour-saving methods or devices. True, there were a few exceptions, but even they were hardly comparable with what is seen to-day.

The Poultry Industry in 1915.

Perhaps the backward state of the poultry industry as late as 1915 is best epitomised in portion of a paper read by me at the Poultry Conference at Hawkesbury in June of that year. It read as follows:—

"The time when poultry-keeping was looked upon as a hobby or an adjunct to general farming is passing away, and specialisation is taking its place. This is lifting poultry-keeping to the dignity of an industry, the importance of which is only beginning to be recognised. Thus we are following the modern tendency to specialise. This should result in cheapening production by enabling farmers to increase their output with a minimum amount of labour, and should also facilitate buying and selling to better advantage. This brings with it new conditions calling for special knowledge, advanced methods, and skilled operators. At the present time the great need of the poultry industry is trained men, and our weakness is the promulgation of too many ideas, and the want of definite methods. It is

questionable whether there is any other industry in which there is so much of the 'every one has a way, and every way does,' as in poultry-keeping. Obviously this is a serious obstacle to progress, and results in an awful waste of energy—waste I see too much of every day. Methods that perhaps succeed in handling small numbers, mostly fail where larger operations are attempted; hence the necessity for definite practical methods.

"The recognition of these facts has led to an effort on the part of the Department of Agriculture to organise a poultry instructional branch and demonstration farms, such as are being built at the Hawkesbury Agricultural College, and at Wagga and Grafton Experiment Farms, where it is hoped to be able to inculcate progressive and definite methods of poultry culture, and to train men to become proficient in poultry management. It is also intended to enter upon experimental work for the benefit of poultry-keepers generally.

"The need for this is fully recognised. 'Rome was not built in a day,' and such work will necessarily take time to inaugurate on sound lines. Stock has to be bred up for the purpose of experimentation, and proper dispositions made, so that reliable data can be secured. Time and money will be required to carry out these objects, but in all this we can confidently look forward to the sympathetic interest of the Minister, and Under Secretary of Agriculture.

"A great weakness in the poultry industry, to my mind, is the lack of organisation. At the present time poultry-keepers are scattered units without any cohesion whatever, either in the matter of buying or selling, or for the purpose of acquiring knowledge and instituting uniform methods into their business. The sooner we recognise our weakness in this respect the better for every one engaged in the industry. I consider that we are a quarter of a century behind the dairying industry with its butter factories, creameries, and special organisation at all points. The time was, within my knowledge, when the dairying industry was in much the same position as the poultry industry to-day. Winter time found butter 2s. and 2s. 6d. per pound, and summer time brought with it such prices as 6d. to 8d. per pound, and dairymen complained of the small amount of butter they were producing in winter, and the low prices they received when it became plentiful.

"That is exactly our position at the present time, but dairymen are infinitely better off to-day when prices are more uniform throughout the year. Not only in the matter of production and prices is there an analogy to be drawn, but to a certain extent in the matter of feed; but the silo, and provision for growing green feed has come with extended knowledge, also uniform and definite methods. These factors have altogether changed their conditions, and to-day the dairying industry is looked upon as one of the most prosperous of our primary industries, and capital is being put into it.

"What has brought about this change? The answer is, knowledge and organisation, which has found expression in uniform methods, improvement of their herds, cold storage, and export."

Where Progress has been Made.

Looking back over the period since the above paper was read one can observe almost complete transformation in the class of equipment on commercial poultry farms, and one sees to-day hundreds of farms with substantial buildings and equipment which could not have been imagined a dozen years ago. The adoption of labour-saving devices, too, has kept pace with the labour problem, and altogether poultry-farming is now looked upon as a business in which business methods are followed.

Commercial poultry-farming has forged right ahead of the fancy side of poultry-keeping, which formerly was a big factor in production. The commercial poultry classes have become a prominent feature in our poultry shows—so much so that no poultry club would dream of eliminating the utility classes from their schedule.

On the other hand, the committee directing the Egg-laying Competition at the College is not likely to cancel, but rather to extend, the standard bred classes in these tests, although up to quite lately the wisdom of retaining them has from time to time been questioned. Thus my advocacy of "one breed one type" has been gaining ground as the years have passed, until to-day if one is looking for the best birds in a show he must take into account the so-called utility classes or run a risk of missing his objective.

So much for one reform of which there was much need, and which, in my opinion, is saving the poultry industry even now from at any rate partial disaster, in so much as it has focussed attention on the absolute necessity for breed character as the basis of stock on our farms. This policy has had such a modifying effect both on the extreme show type and on the birds kept for laying purposes as will, I trust, save some of our best breeds from oblivion.

Size of Birds.

In the early days of my official connection with the Egg-laying Competition an idea was gaining ground that small birds, of whatever breed, were the best layers. If one took only the two extremes—that is to say, small and very large—there was indeed some truth in this contention, but there is a medium in most things, and size was no exception to that rule. Hence it was that, against much opposition, minimum weights were enforced on entrants in these tests and higher general averages of laying have since been secured. The better results accruing were not confined to the competition, but spread to the whole of the industry, in so much as the enforcement of minimum weights called attention to the necessity for size of stock generally being maintained on commercial farms, and set the farmer to work with scales, &c., to find out the physical condition of his flock. To-day no one is looking for big coarse specimens of any breed for laying purposes, but almost everyone is striving to keep up a fair size compatible with the breed character, and I venture to say that nowhere in the world is there a better average of size and physique, combined with high production, than on the farms of this State.

During the period between then and now the establishment of a big new poultry section at Hawkesbury Agricultural College and of smaller ones, also on up-to-date lines, at Wagga and Grafton Experiment Farms, has enabled the Department to institute practical as well as theoretical instruction to students at those institutions, and in addition, to demonstrate advanced poultry culture on commercial lines. The Department is now hatching and rearing some 12,000 chickens annually, and is, in addition, carrying out a very large amount of experiment work, whereas previous to 1915, for all practical purposes this work (except for the egg-laying tests) was non-existent.

In addition, the whole of the egg-laying competition has been brought on to a single hen basis, and some 540 hens are tested annually for breeders and each individual record is sent to the owners.

Educational facilities have also been afforded, for cadetships have been established for the training of youths as poultry instructors, with the result that the Department is now training its own staff.

The activities that have been carried on by the Department, such as lectures, advisory work among poultry-farmers, the issue of publications (including the monthly "Poultry Notes," and the book, "Poultry Farming in New South Wales"), need but a passing mention to emphasise their value to the industry. All this has been in the nature of foundation work.

Necessary Reforms and Projects.

When reviewing what has been accomplished, one realises that a good deal remains to be done to keep pace with the growing importance of the poultry industry. For instance, there has been a lack of organisation of sufficient strength to bring poultry keeping into line with other primary industries of much less importance, though in season and out, attention has been directed to the need for such a development. True, attempts have been made—one by the National Utility Poultry Breeders' Association, and the other by the Poultry Farmers' Association—but both have failed to bring about the cohesion which is absolutely necessary to the well-being of the industry. A third attempt is now being made—let us hope, with more promise of success. If poultry-farmers will only drop their prejudices, shake off their apathy, and pull together, all might yet be well. That a sound, progressive organisation might result from the present effort is the desire of all well-wishers of the industry.

One very necessary reform in the marketing of poultry produce was suggested in a paper read by myself at the Poultry Farmers' Conference at Hawkesbury Agricultural College in June last. An extract from it will show the great need for reform.

"I believe that when we have evolved a proper system of handling eggs it will be something on this basis:—The eggs will be gathered on the farm twice per day, will be carefully handled in all respects, and will receive more care in transit and on agents' floors. Next—and I desire to emphasise this point—they will be repacked into odourless fillers and flats, and properly

tested and graded during the repacking, as is done for export. Then all eggs not sold within forty-eight hours will be run into chilling chambers, the temperature of which will not exceed 45 deg. Fah., and if they are to be kept any length of time the temperature will be not more than 33 deg. Fah. Under those temperatures they will be kept until rquired for distribution. When such a method of handling and holding eggs has been evolved—and not until then—we shall be able to guarantee first quality eggs to consumers."

Recent experience in the disposal of our eggs locally has shown that consumption is capable of absorbing almost the whole of our egg supply, if quality can be guaranteed. This means that if we are equally particular with regard to the quality of eggs put upon our own market, as with those exported we shall have but a small surplus to export. No time should therefore be lost in putting into operation such measures as are suggested above, and in framing regulations which will fix standards of quality and size grades in respect of eggs retailed to the public. Such regulations would very largely increase the local demand for eggs.

Another necessary innovation is the registration of poultry-farms in order to insure better statistical records, and for any necessary control in connection with disease. Registration and inspection of hatcheries which cater for the day-old chicken trade must also come—indeed is urgently necessary in order to protect the public in regard to the quality of the stock supplied.

In conclusion, I would emphasise that complete and effective organisation of the poultry industry is the only way by which these reforms can be brought about, and the future prosperity of the industry assured.

Clean Milk Competitions.

According to the *Journal of the Ministry of Agriculture* clean milk competitions have now been put into practice in over forty counties in England and Wales, so that the movement has spread throughout practically the whole of the country. During the progress of these contests, interim reports are issued to competitors relating to the results of bacteriological and chemical analyses of samples, and giving the comments of the inspecting judges after their surprise visits. The chief educational value of the competitions, however, lies in the advisory service provided. In many cases clean milk demonstrations are held in association with the competitions, and, in addition, advisory visits are paid to all competitors by members of the staffs of the Local Authorities for Agricultural Education. In general an advisory visit is paid to each competitor at least three or four times—a sufficient indication of the extent of the service.

The value of the competitions, however, lies not only in the work that is achieved as far as the competitors are concerned, but also in the example that is set to all producers of milk. The propaganda value of the competitions is also important since the articles and notes on them which appear from time to time in the Press tend to give the consumer confidence in the milk supply, and probably lead to an increased consumption.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1928.

Society and Secretary.		Date.
St. Ives (F. Conway)	Jan.	13, 14
Dapto (E. G. Coghlin)	,,	13, 14
Bangalow (W. H. Reading)	,,	25, 26
Eden (H. P. Wellings)	Feb.	9, 10
Wollongong (W. J. Cochrane)	,,	9, 10, 11
Gosford (E. H. Fountain)	,,	10, 11
Tahmoor (E. S. Key)	,,	10, 11
Leeton (W. Roseworn)	,,	14, 15
Cessnock (D. B. McGilvary)	,,	16, 17, 18
Castle Hill (W. H. Taylor)	,,	17, 18
Newcastle (E. J. Dann)	,,	21 to 25
Uralla (D. G. Evans)	,,	22, 23
Blacktown (J. McMurtrie)	,,	24, 25
Dorrigo (J. H. Skeoch)	,,	28, 29
Inverell (E. A. Clarke)	,,	28, 29, Mar. 1
Tumut (H. Mount)	,,	29, Mar. 1
West Maitland (M. A. Brown)	,,	29 to Mar. 3
Nabiac (E. A. Carey)	Mar.	1, 2
Bellingen (J. F. Reynolds)	,,	1, 2
Robertson (J. K. Hamilton)	,,	2, 3
Nimmitabel (R. Draper)	,,	5 to 8
Tumbarumba (M. Kinstler)	,,	6, 7
Nimbin (S. H. Kilminster)	,,	7, 8
Walcha (A. D. Murchie)	Mar.	7, 8
Braidwood (R. L. Irwin)	,,	7, 8
Yass (C. N. Howard)	,,	7, 8, 9
Taree (R. Plummer)	,,	7, 8, 9
Moss Vale (W. Holt)	,,	8, 9, 10
Rydal (H. Murray)	,,	9, 10
Gundagai (P. J. Sullivan)	,,	13, 14
Crookwell (P. R. Marks)	,,	13, 14, 15
Armidale (A. McArthur)	,,	13 to 16
Mudgee (O. Watkins)	,,	15, 16, 17
Orange (G. L. Williams)	,,	20, 21, 22
Quirindi (G. Curtis)	,,	21, 22, 23
Kempsey (N. W. Cameron)	,,	21 to 23
Blayney (J. H. Moore)	,,	27, 28
Batlow (C. S. Gregory)	,,	27, 28
Muswellbrook (R. C. Sawkins)	,,	27, 28, 29
Sydney Royal (G. C. Somerville)	April	2 to 11
Wingham (D. Stewart)	,,	25, 26
Grafton (L. C. Lawson)	,,	25 to 28
Forster (W. Poppenhagen)	,,	27, 28
Casino (P. W. Swanson)	May	1, 2, 3
Kyogle (D. Campbell)	,,	9, 10
Wagga Wagga (F. H. Croaker)	Aug.	21, 22, 23
Ganmain (C. C. Henderson)	Sept.	11, 12

For Success in Sheep-breeding.

The secret of successful breeding of sheep is a gradual fixing of characteristics that improve utility, and for this purpose high-class rams are introduced into the flock. Many failures in attempts to breed up a flock are directly traceable to the owner having no other purpose in mind than a desire to procure a sire as cheaply as possible from any source and of any type. No man can attain success who purchases different types of sheep from various breeders, and thus introduces different strains. The farmer who has sheep, either as a speciality or as an adjunct to his farming operations, must first decide upon the line of breeding he desires to pursue, and then keep true to it. No matter what the ultimate object may be—the production of wool, carcase mutton, or early lambs—success depends much on the attention to detail.—H. McCallum, in the *Journal of Agriculture*, W.A.

Shipments of phosphate from Nauru and Ocean Islands for the year ended 30th June last—the seventh under the control of the British Phosphate Commission—were approximately 593,300 tons, as compared with the previous highest output of 470,700 tons in 1924-25, an increase of about 122,600 tons. This increase resulted mainly because of unusually favourable weather throughout, and satisfactory labour and health conditions.

With the object of increasing the output from both the islands an extensive programme of development has been decided on, starting with an improvement of the shipping facilities. Contracts have been signed for the construction of a loading cantilever at Nauru, and an improved steel jetty at Ocean Island. The cantilever for Nauru embodies some unique features suited to the special conditions pertaining there. The plant will be operated electrically and it is hoped that on completion the annual output capacity will be increased to over 700,000 tons.

Orchard Notes.

DECEMBER.

C. G. SAVAGE and H. BROADFOOT.

To reduce loss of moisture by capillarity and by transpiration through weeds, the cultivator should be kept going. A good soil mulch is thus maintained and weed growth prevented or destroyed. In a climate such as ours, where loss of moisture by evaporation is considerable and where rainfall is irregular, conservation of soil moisture is of paramount importance and cannot be neglected without loss. The prudent orchardist takes no unnecessary risks, but he keeps his cultivator at work, thereby conserving soil moisture for his trees.

Drains.

No prudent orchardist neglects to provide a proper system of surface drainage, nor having provided it neglects to keep it clear. During this month, heavy rain storms frequently occur, and if surface drainage is not effectively maintained, much soil is washed from higher to lower levels, and the orchardist is put to labour and expense to replace it.

Pests.

Among the many pests which should engage the vigilance of the apple and pear grower is the codlin moth. The spraying for this pest needs careful and thorough attention. It is necessary in order to secure the best results that all fruit should get a good coating of lead arsenate during each spraying. Growers would be well advised to carefully inspect the trees and remove any infested fruit, and to destroy it immediately by boiling or burning. The bandages should be carefully examined at the stipulated time, and any grubs found harbouring should be destroyed. When removing the bandages from the tree to examine them, care should be taken to watch for any grubs that may fall to the ground.

Growers who are consigning fruit at the present time should be careful that they do not introduce fresh codling moth or any other pests into their orchards in returned cases. It is no guarantee that because perfectly clean fruit is being forwarded the cases will come back free from infection. On arrival at the orchard all used cases should be immediately dipped for three minutes in boiling water. This is the safest way of disinfecting them. It is quite a common occurrence to see growers spending time and money fighting this pest on the orchard, and introducing fresh infestation by means of second-hand cases. Too much stress cannot be laid upon the importance of treating returned cases for the destruction of codling grubs so soon as they arrive at the orchard.

A close watch should be kept for slugs on pear and cherry trees, and if noticed the trees should be at once sprayed with lead arsenate. Where the fruit is just about ready to pick when the slug appears, spraying should be delayed until just after the picking is completed. This pest is easy to control, but if not checked it will do a considerable amount of damage.

The control of fruit fly should receive the attention of growers, as it is only by concerted action that satisfactory results can be obtained. Growers in those districts which are free from this pest should do all in their power to keep them free, while in infested districts fruit found to be infested should be promptly destroyed by burning or boiling.

Thinning.

In many localities some varieties of apples and pears are carrying exceptionally heavy crops, and in order that the fruit may develop to a satisfactory commercial size a portion of the fruit should be thinned. There are many commercial varieties of apples and pears which require thinning under only exceptional circumstances. On the other handy varieties of apples which bear in clusters, such as Yates and Rokewood, and pears such as Beurre de Capiaumont and Winter Cole, will greatly benefit if thinned judiciously. This operation should not be started until the fruit has set well, and after natural shedding has taken place. When thinning, care should be taken to space the fruit and remove any fruit which is malformed or badly blemished.

The chief advantages of thinning are as follows:—

It lightens the overloaded tree, and the remaining fruit has a much better chance of attaining a good commercial size and commanding better prices

The handling costs are less.

It gets rid of undesirable specimens of fruit to the advantage of better specimens.

It assists in regulating crops of marketable fruit.

Spraying can be more thoroughly carried out, and as a consequence is more effective.

Growers would be well advised to inspect all young trees and remove any fruit which is likely to retard their development. A few apples or pears on young trees may be responsible for the breaking or bending of limbs which have not developed sufficiently to carry the weight of fruit, and the amount of fruit harvested from such trees is extremely poor compensation for the damage done. It is most desirable that trees should be properly developed before they are allowed to carry fruit.

These remarks apply to other kinds of fruit trees as well as apples and pears.

Marketing.

Growers of early stone fruit will be kept busy this month forwarding consignments to market. In order to secure the best results the trees

should be gone over several times, as all the fruit does not develop simultaneously. The great advantage of doing this is, that only the best specimens and those which have reached the right degree of maturity are removed, and the remaining immature ones are allowed to increase in size and improve in quality. Stone fruit should be picked with extreme care; it should be firm but properly matured, so that the natural ripening process will still continue after it has been removed from the tree. If the fruit is picked too green it will shrivel and be hard to dispose of.

Care should also be taken not to allow the fruit to become over-ripe, as some time elapses between a consignment leaving the orchard and reaching the consumer, and if it is over-mature when it sets out it has little chance of reaching the market in anything like good condition.

When packing, see that the grading for size and quality is well done, and that the cases are not packed too high or the fruit forcibly squeezed into place. On the other hand, packing fruit too low should also be guarded against.

Drying Apricots.

In many localities apricots will be ready for drying this month. To secure the best article the fruit should not be pulled until fully ripe, but not overripe. The general procedure is to pick the fruit carefully into cases when it is fairly soft, as in that condition it makes the best article. It will be necessary to go over the trees several times as the fruit does not all develop simultaneously. Too much stress cannot be laid upon the necessity for handling and picking the fruit carefully at the right degree of maturity.

As soon as possible after picking, the cases should be carted to the cutting shed, where the fruit should be most carefully and evenly cut in halves (not pulled apart), and the pits removed. The fruit should then be placed on trays with the cup side up, and as soon as possible each tray should be removed to the fumigator, where it can remain with the door closed until the fumigator is sufficiently full to start the sulphur burning. This is of great importance, as once the fruit has been cut it must not be exposed to sun or wind, or its appearance will be adversely affected. When everything is ready sulphur should be placed in the burner at the rate of approximately 1 lb. to 200 cubic feet of room space. If possible allow the fruit to remain in the sulphur room from eight to ten or twelve hours or until the cup is full of juice. The trays of fruit can then be taken from the fumigator and placed on the drying ground.

When the sun is the sole or main drying agent a drying ground should be provided, and to facilitate and provide for economical working the ground must be laid out in such a way that the fruit can be carried on trucks to any part of the ground. It is one of the essentials of the drying ground that it should be as free from dust as possible.

When stone fruit is being dried it is better not to leave tracks or paths between the trays, but to cover the whole of the ground so that there are only the outside trays to watch. The borders and any paths that are left

should be kept well sprinkled with water. Growers are advised to get the bulletin on "Fruit Drying" issued by the Department; the price is 10d., post free.

When drying whole apricots only the best specimens should be selected, as small fruits are little else than skin and stone when the drying process is completed, and the placing of inferior fruit on the market always tends to spoil the sale of the superior article. The quality of the whole-dried apricot is superior to that of the split fruit, and if treated in the right way it contains less sulphur.

One of the most successful methods of dealing with whole fruit is to pass it through a boiling caustic soda solution (1 lb. caustic soda to each 30 gallons of water). The fruit should be dipped quickly—immersed for about two seconds—and after draining passed through a cold water bath to remove the excess of caustic soda. The wash bath is important, as it tends to reduce the amount of sulphur absorbed by nearly 50 per cent. as compared with unwashed fruit.

The fruit is then placed on the drying trays, care being taken that each fruit is put on its side; this gives a flat, large-sized product. Fruit placed either on the apex or base dries out an uneven shape, and the stone in many cases breaks through the skin.

When sufficient trays are filled they are placed in the sulphur house or box, and submitted to sulphur fumes for eight to ten hours. From the sulphur box the fruit is spread out in the sun to dry, and the process can be completed in the shade. There is no danger of dipped fruit blistering, as whole apricots do when not dipped and placed directly in the sun. The fruit should be ready to take off the trays in eight to twelve days.

Manuring Citrus Trees.

In many localities citrus trees have set very heavy crops, and growers would be well advised where the setting has been heavy to give the trees a dressing of 2½ lb. of sulphate of ammonia or 3½ lb. of nitrate of soda.

The application of a nitrogenous fertiliser will greatly assist in the development of the crop, and at the same time encourage the growth of fruiting wood for the following year.

Grafted Trees.

The ties on grafts should be left on as long as possible, but as soon as they commence cutting into the limb they should be removed. It is quite a common thing to see this neglected, and as a consequence large numbers of grafts are lost, particularly when a bark graft has been used. When the grafts are inserted in the stock, the material used for tying is bound round the limb very tightly, and as the graft grows there is no room for it to expand; consequently a very weak part on the limb is created. The first reminder a grower gets that he has neglected to remove the ties is an unpleasant one after a windy day, when he sees large numbers of grafts broken or blown off the trees.

INDEX

To Vol. XXXVIII, 1927

SUBJECT INDEX.

AUTHOR INDEX.

Sydney: Alfred James Kent, Government Printer—1928